# THE GLACKMEYER REPORT

# OF

# MULTIPLE LAND-USE PLANNING

ONTARIO DEPARTMENT OF LANDS AND FORESTS

HON. J. W. SPOONER
MINISTER

F. A. MacDOUGALL
DEPUTY MINISTER

1960

ERRATA SHEETS

GLACKMEYER REPORT

## ERRATA

Page v, top of page: *Insert* the heading CONTENTS
Page v, page of Section IID: *For* 58 *read* 59
Page ix, page of photograph 2: *For* 40 *read* 41
Page ix, under Tables: *For* 3 Progress of Improvement of Settlement Lands Farming Effort Classes ..... 52 *read* 3 Progress of Improvement of Settlement Lands ..... 52
Page x, page of Table 10: *For* 59 *read* 58
Page 2, line 1: *Insert* (3) before Summary Statement of Recommendations
Page 2, part (c): *For* (See ...., page 16) *read* (See ...., page 17)
Page 2, part (e): *For* (See ...., pages 28-29) *read* (See ...., pages 28-30)
Page 3, headings near top of page: Heading B should precede heading (1)
Page 4, line 9: *For* recommendations for any research *read* recommendations for the development of the area and for any research
Page 4, line 11: *For* Glackmeyer Develop- Area *Read* Glackmeyer Development Area
Page 5: Close up lines 5 and 6 to form one paragraph.
Page 6, 12th line from bottom: *For* of and additional *read* of an additional
Page 7, 15th line from bottom: *For* Recommendations 12 and 3 on P. 15). *Read* Recommendations 1, 2 and 3 on pp. 15 to 17).
Page 7, 5th line from bottom: *For* Recommendation on P. 16). *Read* Recommendation 3 on P. 16).
Page 12, line 1: *For* woodlot management designed:- *read* woodlot management is designed:-
Page 13, line 12: *For* would be satisfactory objective *read* would be a satisfactory objective
Page 17, line 1: *For* and guiding of guiding applicants *read* and guiding of applicants.

Page 28, 14th line from bottom: *For* at least 499 feet *read* at least 400 feet

Page 29, 12th line from bottom: *For* have a use *read* have a primary use

Page 33, line 12: *For* 1957 census *read* 1956 census

Page 38, 2nd line from bottom: *For* Clay Belt priority *read* Clay Belt be priority

Page 41, second last line in photo caption: *For* a long view it *read* a long view they

Page 44, line 16: *For* (See Section II) *read* (See Research Supplement II)

Page 45, line 19: *For* The subordinate vegetation of herbs and blueberrys *read* The subordinate vegetation of herbs and shrubs

Page 50, line 4: *For* The 52,825 acres *read* The 52,285 acres

Page 51, 2nd line from bottom of lower photo caption: *For* the clearing has preserved *read* the clearing has been preserved

Page 53, line 2 in photo caption: *For* excess peat, and breaking-up of clay pan layers *read* excess peat, breaking-up of clay pan layers

Page 53, line 1 of text: *For* agricultural development has provided *read* agricultural development was provided

Page 59, 6th line from bottom: *For* It is anticipated within the Primary Agricultural Area. *read* It is anticipated, however, that by 1980 there will be 100 well developed farms within the Primary Agricultural Area.

Page 67, 8th line from bottom: *For* For example, agricultural farms *read* For example, agricultural experts are undecided whether the numbers of productive farms

Page 72: Note that last two lines are text and not part of Table 17.

Page 74, line 7: *For* 30 cords. (1) Forest *read* 30 cords. (1) Forest

Page 74, line 9: *For* Site Region. (2) *read* Site Region. (2)

Page 74, 9th line from bottom: *For* high productivity for specific site. *Read* high productivity for the specific site.
Page 80, line 21: *For* absentees owners. *read* absentee owners.
Page 83, 12th line from bottom: *For* is negligible. Permanent *read* is negligible. Thus, in an absolute sense, there are no permanent forest lands in the Glackmeyer Development Area. Permanent
Page 87, line 11: *For* (a) Interm Forestry Units *read* (a) Interim Forestry Units
Page 89, line 6: *For* on the lands which may be *read* on the Class D lands. The clearings on lands which may be
Page 89, 7th line from bottom: *For* forestry planning into 7 composite clearings *read* forestry planning is concerned. Most of these cleared lands can be grouped into 7 composite clearings.
Page 89, 6th line from bottom: *For* 350 acres revert to scrub *read* 350 acres. If the clearings are not maintained, they will revert to scrub
Page 91, (7) Plan for Block A (Primary Agricultural Area): *Insert* Block A has been subdivided into six classes of areas in the Forest Land-Use Plan. These classes are the following:-
Page 95, line 3: *For* controversy arised *read* controversy arises
Page 96, line 16: *For* if not its *read* if not in its
Page 103, line 17: *For* where needed. *read* when needed.
Page 103, line 27: *For* purpose *read* for recreational purpose
Page 115, line 13: *For* glacier deposits are known *read* glacier are known
Page 115, 3rd line from bottom: *For* bedrock in the Clay Belt *read* bedrock is often apparent in the surface relief. It is assumed that the features of the underlying bedrock in the Clay Belt
Page 116, line 5: *For* bedrock, kame and esker *read* bedrock is extremely local. However, the underlying bedrock, kame and esker

Page 119, line 10: *For* This landform is .... till is the these deposits *read* These are areas of moderately deep till (varying from three to thirty feet in depth) overlying bedrock. The manner in which the ice melted after laying down these deposits

Page 119, 6th line from bottom: *For* and the poorly drained sags *read* and (b) the poorly drained sags

Page 125, line 3: *For* (i) Regional Climate *read* (1) Regional Climate

Page 127, line 6: *For* extensive character of the various soil horizons *read* extensive areas of this region. For sites which have been altered by disturbances, the character of the various soil horizons

Page 130, line 19: Following Research Supplement III. *read* For soil type pattern see page 153.

Page 130, 15th line from bottom: *For* on the Cochrane drumlin landtype .... Cochrane kame landtype. *read* on the Cochrane drumlin landtype than on the Cochrane kame landtype.

Page 131, line 1: *For* is greater on the Cochrane kame landtype *read* is greater on the Cochrane drumlin landtype than on the Cochrane kame landtype.

Page 131, 8th line from bottom: *For* dept *read* depth

Page 141, 12th line from bottom: *For* clay-pan glei becomes initiated. *read* clay-pan glei have been initiated.

Page 146, line 7: *For* A1 *read* A2

Page 147, line 7: *For* with brown mottling or blue-grey mask. *read* with incorporated organic matter.

Page 150, line 11: *For* This group or organic soil types *read* This group of organic soil types

Page 160, 10th line from bottom: *For* with the mineral culturally developed *read* with the mineral material and more generally in soils which are dark grey gleisolics culturally developed

Page 160, 5th line from bottom: *For* serious hinders *read* seriously hinders

Page 161, 13th line from bottom: *For* (page 7) *read* (page 172)
Page 162, line 22: *For* guide settlement and a general way *read* guide settlement and in a general way
Page 165, 6th line from bottom: *For* other organisms *read* other micro-organisms
Page 170, line 22: *For* reclamable *read* reclaimable
Page 170, 8th line from bottom: *For* The following types of land are included in: *read* The following types of land are included in Agricultural Use Capability Class E:-
Page 174, line 20: *For* Diagram 5 *read* Diagram 10
Page 174, 14th line from bottom: *For* outlined in the subsections (I to IV). *read* outlined below.
Page 176, 7th line from bottom: *For* Diagram 5. *read* Diagram 10.
Page 187, last word in table: *For* Caladonia *read* Cladonia
Page 194, line 2: *For* evaluation of the yield-quality classes *read* evaluation of the yield-quality production of the best sites of the region, and yield-quality classes
Page 194, 11th line from bottom: *For* trough *read* troughs
Page 197, line 11: *For* feature *read* features
Page 198, line 2: *For* are dissected troughed plain and lower slope land-types. *read* are stream-dissected troughed plain (TS) and lower slope landtypes (L).
Page 204, 5th line from bottom: *For* wood requirements cannot be limited *read* wood requirements. The estimate of future wood requirements cannot be limited.
Page 204, 2nd line from bottom: *For* supply of forest productions. *read* supply of forest products.
Page 208, 5th line from bottom: *For* envisionaged *read* envisaged

# A MULTIPLE LAND-USE PLAN FOR THE GLACKMEYER DEVELOPMENT AREA

THE REPORT OF THE GLACKMEYER SUBCOMMITTEE
OF THE NORTHERN REGION LAND-USE PLANNING COMMITTEE

G. A. Hills, Chairman  R. Portelance, Co-chairman

with

RESEARCH SUPPLEMENT

G. A. Hills and A. N. Boissonneau

ONTARIO DEPARTMENT OF LANDS AND FORESTS

HON. J. W. SPOONER
Minister

F. A. MacDOUGALL
Deputy Minister

1960

MEMBERSHIP OF THE GLACKMEYER SUBCOMMITTEE
OF THE NORTHERN REGION LAND-USE PLANNING COMMITTEE

Initial Subcommittee for Meeting of March 20th. 1956

R. C. Passmore, Chairman and Secretary
E. K. E. Dreyer
G. A. Hills
R. Portelance
A. N. Boissonneau
G. Simons

Subcommittee for the 1956 Working Period

E. K. E. Dreyer, Chairman
A. N. Boissonneau, Secretary
G. A. Hills
R. Portelance
G. Simons
J. Bell

Subcommittee for the 1957-58 Working Period and the Preparation of the Report

G. A. Hills, Chairman, Land-Use Research
R. Portelance, Co-chairman, Agriculture
A. N. Boissonneau, Secretary, Forestry
J. Bell, Reforestation
N. D. Patrick, Fish and Wildlife
G. Simons, Land Grants

Preparation of Maps and Editing of the Report

Staff of the Division of Research,
Ontario Department of Lands and Forests

NORTHERN REGION LAND-USE PLANNING COMMITTEE

Chairmen: 1954-56, O. F. Hess; 1956-58, L. Ringham

Co-chairman: 1954-58, G. A. Hills

# FOREWORD

It is with a deep sense of satisfaction that I am privileged to introduce this report on Land-Use Planning in the Cochrane Clay Belt.

For nearly half a century, a million and a quarter acres of this vast clay plain have been opened for settlement. Although this period is a brief interval when compared to the history of established agricultural areas, it has been sufficient to demonstrate man's misuse of land in the area covered by the report. The few thousand acres which can be classed as fully established farms have achieved this status through the manhandling of many thousand acres. The progress of settlement has left behind a much larger area composed of the partial clearings of abandoned farms growing back to brush and cut-over lands forested with inferior tree species.

The reader will find that the Subcommittee have produced a report which contains a plan for the future development of both forestry and agriculture on the lands best suited for the purpose. Also there has been no hard and fast line drawn between these two main endeavours, but recognition has been made of the fact that the area will lend itself for many years to come to a farm-forest economy. Provision has also been made to ensure the use of land for the production of wildlife and to satisfy the general public demands for recreational areas.

Perhaps of greater importance to the forester or agriculturalist are the benefits to be derived from the processes carried out in putting the plan into action. Such a basic recommendation contained in the report as the one pertaining to land classification will illustrate this view. The system of land classification, if carried out, would first ensure that the future farms would be located on soils best suited for agriculture. Benefits would not only be derived by the farmer in the form of better yields, but it would ensure that public funds in the form of subsidies were being invested in the best land. The forest manager would be provided with site information vital to the practice of forestry on a more intensive scale. Also the freeing of certain lands not immediately required for agriculture would provide the opportunity to increase the the forest yield on more accessible lands. This latter point is of consequence to both the farmers and the local timber industry.

On behalf of the Northern Region Land-Use Planning Committee, I wish to congratulate the members of the Subcommittee for their efforts in producing a report of such high standard. If nothing else, the report has pointed up the need for a pause to re-assess the capabilities of the land in the Cochrane Clay Belt as it approaches the fiftieth year of its development.

L. Ringham, Chairman
Northern Region Land-Use Planning Committee

June 19th, 1958.

# ACKNOWLEDGEMENTS

The members of the subcommittee are deeply indebted to Mr. Q. Hess, former Regional Forester in the Northern Region, for his foresight in preparing a suitable working environment for those interested in Clay Belt land-use problems from many points of view. This environment permitted the subcommittee to work at the field level in an organized but informal and somewhat extra-official way in order to attain a unified understanding of the problem as a whole. The subcommittee is likewise indebted to Mr. L. Ringham, successor to Mr. Hess as Regional Forester, for assuming a similar role in promoting the project.

The subcommittee greatly appreciates the sympathetic understanding of Mr. T. R. Hilliard, Director of the Extension Branch, Ontario Department of Agriculture, in encouraging Mr. R. Portelance, Agricultural Representative at Cochrane, in his subcommittee work. The assistance of Mr. W. A. Montcalm, Director of Field Services in the Extension Branch and for many years Agricultural Representative in the Cochrane Clay Belt, is gratefully acknowledged.

The subcommittee wishes to thank Mr. R. N. Johnston, Chief of the Division of Research, Ontario Department of Lands and Forests, for his interest and cooperation in supporting the members of the Site Section in their work of directing the pilot study, making field observations, preparing portions of the report, editing the report, typing the many manuscripts and in compiling and draughting the maps. The work of Mr. N. W. McLeod and his assistant in giving such excellent cartographic expression to the maps has greatly enhanced the usefulness of the report.

The subcommittee is most grateful to Mr. G. H. U. Bayly, Assistant Deputy Minister, Mr. J. A. Brodie, Chief of the Division of Timber, Mr. A. S. Bray, Regional Director (North-Western Ontario), and Dr. J. K. Harkness, Chief of the Division of Fish and Wildlife. These officials of the Ontario Department of Lands and Forests at Toronto, in their 1956 positions as Chiefs of the Divisions of Reforestation, Timber Management, Lands, and Fish and Wildlife, cooperated with Mr. F. L. Hall, District Forester at Cochrane, in making possible the participation of district supervisors engaged in these various fields.

# PREFACE

The objective of the authors of this report has been to present a practical solution to land-use problems within a sound scientific framework. In order to present their findings in a form which will facilitate the implementation of measures which are most urgently needed, the members of the subcommittee have attempted to write the report proper in as non-technical a style as possible. In view of the great amount of research energy which has been expended it was felt that the opportunity to demonstrate the research approach to land-use problems should not be passed over. Accordingly, a research supplement has been prepared by members of the Research Division of the Ontario Department of Lands and Forests. This presents a detailed description of land and land-use in the Cochrane Clay Belt, also the methods and procedures in land-use research which are required in a full understanding of the problems and recommendations presented in the report proper.

Consequently, the report has been written to provide various types of readers with the information they require without reading the full report.

Section I presents a summary of the entire report, dealing chiefly with the information presented in the report proper, but includes a subsection dealing with principles and procedures. The first six pages of section I will give the reader an understanding of the nature of the report and a basis for further selective reading.

Each of the sections dealing with the Agricultural, Forestry, Wildlife and Recreational Land-Use Plans have been prepared in such a way that they may be read as separate units or, more profitably, as parts of the integrated Multiple Land-Use Plan.

Since the entire report is a detailed presentation of the Multiple Land-Use Plan, Map No. 11 is designed to present only an integrated summary of all the individual plans (Maps Nos. 6, 9 and 10), and section VI deals chiefly with the integration aspects of this integrated summary.

The remaining seven maps which accompany the report indicate (a) the distribution pattern of the physiographic features, (b) the past, present and potential land uses, and (c) the interpretations of all these features for future agricultural and forestry land uses. All of these maps form the basis for the various land-use plans.

The work of integration was greatly facilitated by the participation of all the subcommittee members, as a single party, in a field examination of a selected portion of the area (20 lots). Unfortunately, a specialist in wildlife land-use was not available to participate in these early investigations which had as their objective an integrated inventory of the use capabilities of the land. This is the outstanding but not the only example of the handicaps which

the subcommittee experienced through the transfer of personnel from one region to another.

The careful reader will find that, although this report presents a plan for rural settlement, it is not a colonization plan. For it is not written to attract settlers, it is written that those settlers who are attracted and who are sincere in their intentions, may be able to develop the renewable resources of the area with a minimum loss of time and energy to both the individual and the government.

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SECTION V

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SECTION VI

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(In Pocket of Report)



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SECTION 1

## SUMMARY OF THE GLACKMEYER SUBCOMMITTEE REPORT

### A. Summary Statement of Objectives, Methods and Recommendations

#### (1) Objective

To conduct land-use research on a demonstration area in order to obtain data which illustrate the principles and practices of good farm, forest and wildlife management in the Cochrane Clay Belt and thus provide a basis for the formulation of land-use policies.

#### (2) Methods

The observations and interpretations were made by members of the Departments of Agriculture and of Lands and Forests of the Ontario Government who were thoroughly familiar with the field conditions of the area and thus qualified to gather and interpret data at the 'grass roots' level of land-use planning.

The subcommittee, as a single field party, examined thoroughly a restricted area of 20 lots of 150 acres each. The objectives of this preliminary study were:-

(i) to obtain a common understanding of the natural land qualities,
(ii) to discuss objectives and methods of survey,
(iii) to ensure the integration of the observations and conclusions of all the workers in the final presentation.

Upon the completion of this initial preliminary study of 20 lots (3,000 acres), the members proceeded, either individually or in groups, with the various aspects of land use throughout the entire Glackmeyer Development Area which totals approximately 105,000 acres. Aerial photos were used to supplement detailed field work. An outline of the multiple-factor method of land classification and land-use planning used in study is presented in subsection J, pages 40 to 47.

The analysis of the land-use problems of the Glackmeyer Development Area, and the recommended land-use plan for this area, which are contained in this report, are important in themselves and merit the attention of all those who are interested in this specific area. However, because this report also illustrates a fundamental approach to land-use planning which has a broad application, the subcommittee feels that this report merits the attention of all those who are concerned about the wise use of natural resources.

(3) Summary Statement of Recommendations

(a) Recommendations have been made to establish areas of primary agricultural development and to confine agricultural development to these areas until they are fully developed. The purpose of this consolidation and planning of agricultural development is:-

(i) To avoid waste of money and energy (both public and private) in developing lands for agriculture before they are needed.

(ii) To provide the long-term stability of tenure which is required to develop forests on the lands which are not immediately required for agricultural development.

The controls recommended to attain this consolidation and planned development of agriculture are:-

(i) Assistance to farmers in land clearing, drainage, etc. to be confined to those farmers who are located in the primary agricultural area except for bona fide farmers who are already established elsewhere.

(ii) The sale of Crown lands to be restricted to lands of the primary agricultural area.

(See Agricultural Use Recommendation 1, page 15).

(b) Recommendations have been made to reserve suitable areas for secondary and tertiary agricultural development.

The planning of agricultural development beyond the stage of the development of primary areas is a further requirement to assure a stability of tenure of forest lands.

(See Agricultural Use Recommendation 2, page 16).

(c) Recommendations have been made to provide the settler with an adequate acreage for farming.

(See Agricultural Use Recommendation 4, page 16).

(d) Recommendations have been made for the establishment of private and and public forests to aid in the support of the local community.

(See Forestry Use Recommendations, pages 25-27).

(e) Recommendations have been made to reserve land for recreational and wildlife land uses and to investigate these potentials as required.

(See Wildlife and Recreational Use Recommendations, pages 28-29).

(f) Recommendations have been made regarding the manner in which the Glackmeyer Development Plan may be used for planning land use throughout the Cochrane Clay Belt Region. (See part I on pages 31-40).

(1) The Northern Region Land-Use Planning Committee

B. Terms of Reference of the Glackmeyer Subcommittee

(1) The Northern Region Land-Use Planning Committee

In 1954, Mr. Q. Hess, Regional Forester for the Northern Administrative Region of the Ontario Department of Lands and Forests, organized the Northern Region Land-Use Planning Committee. Having been concerned with land-use problems in the Clay Belt for a number of years, Mr. Hess was responsive to requests for action by Mr. R. Portelance, Agricultural Representative, Ontario Department of Agriculture, and by Messrs. F. Hall, F. Sider and L. Sleeman, District Foresters in the Northern Region.

The objective was to obtain the assistance of government officials working in the area in the formulation of an integrated plan to develop the renewable natural resources of the Northern Administrative Region.

The membership consisted of those government officials actually working in the area and concerned with the development of the renewable natural resources. Mr. Hess asked Mr. G. A. Hills to assist him in chairing the meetings because of the many years in which the latter has been engaged in land-use studies in the Cochrane Clay Belt for both the Departments of Agriculture and of Lands and Forests. When Mr. Hess was transferred to another region, the chairmanship was taken over by Mr. L. Ringham, the succeeding Regional Forester who brought with him considerable experience in land-use planning in another region.

Under the chairmanship of Mr. Hess, the committee published a Progress Report No. 1 (''Land-Use Planning and Resources Development in the Northern Region''), being the minutes of the third meeting of the committee.

(2) The Glackmeyer Subcommittee

The Glackmeyer Subcommittee was appointed at the third meeting of the Northern Region Land-Use Planning Committee. The membership of the subcommittee appears on the back of the title page. The terms of reference of the subcommittee were:-

(i) To select an area suitable for land-use research in which the primary objective is to determine the basis for establishing land settlement.

(ii) To make a complete study of present land use in the area selected, including the history of development and the factors influencing this development.

(iii) To determine the land-use capabilities of the area.

(iv) To prepare for the chairman of the Land-Use Planning Committee a complete multiple land-use plan resulting from the research in land-use on this pilot area. The plan to include recommendations for any research necessary to ensure the success of the plan.

(v) To interpret the Multiple Land-Use Plan of the Glackmeyer Area as a basis for planning land use in the Cochrane Clay Belt.

In addition to the six formal meetings of the subcommittee, frequent field discussions took place between various members of the subcommittee.

C. An Outline of the Multiple Land-Use Plan

The agricultural potential of the land in the Cochrane Clay Belt is such that only the best and second-best land (Agricultural Use Capability Classes A and B) are suitable for economic development under the present conditions. Areas with a satisfactory proportion of these classes are scattered throughout the entire Clay Belt. Only 1/9 of these areas has been served adequately with roads, schools, etc. In addition to this, the majority of the well-located lots on the best lands remains relatively undeveloped with many large clearings abandoned. These facts indicate that there are definite limitations to the amount of land which may be profitably developed for agriculture at this time.

Nevertheless, it is important, at present, to ascertain the agricultural use capabilities of the lands of the Clay Belt and to plan for the development of these lands. It is important, firstly, because only the well-developed, well-managed farms of the Clay Belt can compete, with the producers of other areas, for the growing markets of the local mining and pulp-mill towns and other centres of population in the region. As indicated above, such farm units are most easily established on lands of the highest agricultural use capability. Secondly, more land may be required to meet critical food shortages in the not too distant future.

The Glackmeyer Subcommittee was established primarily to determine a basis for deciding what areas in the Cochrane Clay Belt should be reserved for agricultural development in the next 100 years. Therefore, it was deemed advisable to locate an area in which the Agricultural Land-Use Plan would be the basic consideration. The area chosen was the Municipality of Glack-

meyer which includes portions of the townships of Clute, Leitch and Blount in addition to the township of Glackmeyer.

However, the plan recommended by the Glackmeyer Subcommittee is one of multiple land use. In the development of such a plan, all phases of land use cannot be considered simultaneously, nor independently.

Actually, the Multiple Land-Use Plan is a complex of several inter-locking land-use plans. The individual land-use plans must be so developed that, although they may appear to overlap in area as well as in fields of human activity, they will intermesh to produce a plan of unified action. The individual land-use plans proposed are:-

Agricultural Land-Use Plan,
Forest Land-Use Plan,
Wildlife Land-Use Plan,
Recreational Land-Use Plan.

All of the above four plans are generalized within the "Recommended Multiple Land-Use Plan".

The Agricultural Land-Use Plan will be presented first since this use of land is the basic consideration in this area.

D. An Outline of Agricultural Land Use in the Glackmeyer Development Area

(1) Summary of the Agricultural Land-Use Plan

The Agricultural Land-Use Plan demonstrates the way in which agricultural development in the Cochrane Clay Belt may be directed in order that:

(i) a minimum area of land be withheld from forest management during agricultural development,

(ii) a readily accessible source of revenue from forest, wildlife and recreational areas be available to support the local economy.

Although the very best land is needed for the most economic development of farm land, the agricultural potential of the land is not the only criterion for planning. The total acreage of the best and second-best land in the Cochrane Clay Belt is much in excess of that probably required for agricultural development in the next 100 years. Much of this is now inaccessible, but the area of good land, which is either presently served by roads or can easily be made accessible, is at least twice the acreage now being used or in the process of development.

The combination of factors deemed important in a consideration of the magnitude and order of agricultural development is:-

(i) The distribution pattern of lands of high potential.

(ii) The distribution pattern of established farm units.

(iii) The distribution pattern of farm land which has been improved but of insufficient acreage to constitute an established farm unit.

(iv) The distribution pattern of land cleared but not improved.

(v) The location in regard to main highways and markets.

(vi) The extent of present rural services.

For the purpose of analysis, the three periods chosen were 1960-1980, 1980-2000, 2000-2060. The extreme limit of 100 years was chosen on the basis that this is the time period required for one forest rotation.

Following the present ownership pattern as closely as possible, farm units were established which consist of 300 acres of land, at least 100 acres of which are of the best or second-best types in the Clay Belt. These were divided into four classes depending upon the acreage of the best and second-best land. These classes of farm units indicate order of choice,- 1st, 2nd, 3rd and 4th.

The boundary of the primary area was established so that this area would include;-

(i) all the farm units classified as either fully established or partly established,

(ii) sufficient land to provide for the development of and additional 53 farm units, mainly 1st and 2nd choice, to bring the total of established farm units to 100 at the end of the initial period of development (1960-1980).

The boundaries of the secondary and tertiary areas were established so that these areas, together with the primary area, provided approximately 50 units for development in the second period of agricultural expansion (1980-2000), and an additional 50 units in the final period under consideration (2000-2060).

Further discussion of the plan in outline is presented in the following pages summarizing the agricultural use recommendations and the statements which support them.

(2) The Choice of Glackmeyer as a Research Area in Farm-Forestry Planning

(a) The Glackmeyer Area is characterized by a natural land pattern having as high a proportion of good agricultural soils as any area in the Cochrane Clay Belt.

(b) Most of the Glackmeyer Area has been open for agricultural settlement for over 40 years.

(c) A satisfactory farm economy has been established on a few farms scattered throughout the area. The present survey records 26 fully established farm units from which the gross revenues range from $1,000 to $14,000 and average $6,000. Each farm unit averages 1.6 man units and the gross revenue per farm worker ranges from $1,000 to $8,000 and averages $3,750.

(d) An unsatisfactory state of farm development is found on good lands and poor lands alike over most of the area, yet the satisfactorily developed farms are found only on lands with a high potential.

(3) Statements Supporting Agricultural Use Recommendations

(a) The Need for an Agricultural Land-Use Plan

(Statement to support Agricultural Use Recommendations 1, 2 and 3 on P15).

1. Agricultural settlement is inevitable but must proceed under the best legislative controls. The administration of the sale of Crown lands for agricultural settlement requires a policy for the development of lands of varying agricultural potential according to a time schedule designed to meet the following needs;-

   (i) Consolidation of farm units,
   (ii) Consolidation of rural communities,
   (iii) Economic provision of public services.

(b) The Need for District Inter-Departmental Committees

(Statements to support Agricultural Use Recommendation 3 on P16).

1. The Department of Lands and Forests is charged with the sale of Crown land for agricultural development. This involves rating the suitability of the land for agricultural development, and evaluating the development of the farm until the requirements for patent are fulfilled.

*"An unsatisfactory state of farm development is found on good lands and poor lands alike over most of the area." Shown above is an area of predominately good land having, at one time, a settler on every lot, but now abandoned. The road, once good, has fallen into disrepair.*

*This photo also shows "the broadly rolling relief of the clay-capped kame land-type broken by short, moderate to gentle slopes which reflect the kame and kettle topography of the underlying sand and gravel deposits."* *See page 44.*

2. The Department of Agriculture is charged with the technical guidance of the farmers, but has little opportunity to direct agricultural settlement until after patent is issued.

3. The Department of Lands and Forests is charged with the management of all the renewable natural resources on Crown lands and with water resources. In areas of partial agricultural development, there are many problems of integrating the various land uses.

4. In order that the Recommended Multiple Land-Use Plan be satisfactorily implemented, it is essential that an inter-departmental committee be established, consisting of those officials delegated to carry out the policies of the Departments of Lands and Forests and of Agriculture at the district level.

(c) The Need for Integrating the Agricultural Land-Use Plan with other Land-Use Plans

(Statements to support Agricultural Use Recommendations 3, 5, 6 and 7) on P 16-19).

1. In planning the use of undeveloped land, agriculture is generally the use which must be considered first in order that the acreage needed to produce food be reserved within areas possessing land of the very best potential obtainable.

2. Since the best agricultural lands are also the best forestry lands, it is essential that these forest lands should not be laid waste in the false hope of agricultural development. For example, in the Cochrane Clay Belt, 1,500,000 acres of land have been man-handled, yet only 50,000 acres have been sufficiently improved to be considered productive farm land, and another 70,000 acres cleared and somewhat developed.

3. The 'worst-first-for-forestry theory' must be replaced by the 'next-best-for-forestry practice'. The placing of only the very poorest lands under forest management and the opening-up of large areas of moderate agricultural potential in the hope that these will be settled has proven disastrous in many parts of the United States and elsewhere.

4. At no time since settlement began in 1910 has the total annual revenue obtained by rural settlers in the Cochrane Clay Belt from farm products exceeded that obtained from forest products. Without a fully established farm unit, settlers cannot remain on their lot after the timber has gone. These are the main reasons for the abandonment by locatees of 174 lots out of a total of 540 lots which at one or other time were sold in the Glackmeyer Development Area.

5. The future development of agricultural communities in the Cochrane Clay Belt will depend, in large part, on the availability of revenue from forested lands to supplement farm income. Hence the need for the long-term planning of the forest, wildlife and recreational use of land not presently needed for agriculture. Such land is located throughout the Glackmeyer Development Area and includes:-

(i) Permanent forestry units in the primary forestry area,

(ii) Interim forestry units and Crown forests in the areas of of agricultural reserves on lots held for agricultural development,

(iii) Farm woodlots on operating farm units of the primary agricultural area.

6. The area of land occupying the northern part of the Glackmeyer Development Area is designated on map No. 6 as 'land not needed for agricultural development' This area has not been excluded because of a low agricultural potential of the land for it contains blocks of land with a potential equal to that of many farm units recommended for development in the next 20 years. It has been excluded because there is sufficient land in better locations to meet the estimated needs of future agricultural development. Furthermore, this land should be restored to a well forested state and maintained in that condition in order to supplement, as it has in the past, the income of the adjacent rural community.

7. Although the better lands in this northern portion are not designated as agricultural lands in the plan, they must be considered as additional agricultural reserves since they form part of the farm-forestry management unit proposed by the regional planning committee. However, plans should be made to manage the forest for at least two rotations and hence their designation as permanent forest on the Forest Land-Use Plan.

### (d) The Need for a Grant of at least 300 Acres to Each Bona Fide Agricultural Settler

(Statements to support Agricultural Use Recommendation 4 on P17).

1. Study of present farm use in the Glackmeyer Development Area indicates the successful farm holdings total at least 300 acres each with a good proportion of land having the highest potential for agricultural development in the Cochrane Clay Belt (Agricultural Use Capability Classes A and B). See Section II.

2. For efficient use of the capital, labour, equipment, etc. needed to develop and maintain a farm in the Development Area, a unit of at least 300 acres is required.

3. The minimum herd of livestock for profitable operation requires farm holdings of at least 300 acres.

(e) The Need to Sell Crown Land for its Real Worth

(Statements to support Agricultural Use Recommendation 5on P17).

1. The history of agricultural development in the Clay Belt indicates that no real purpose has been served by the Crown making available cheap land.

2. The cost of developing and maintaining lands for agricultural production is many times greater than the value of the undeveloped land. To acquire cheap land without having the means to develop it is not a privilege but a snare for the settler who has a real desire to farm.

3. Cheap land has encouraged a spurious type of settlement by attracting men who are interested only in cutting timber as long as it lasts.

4. The legitimate development of Clay Belt lands will occur when it is profitable to undertake this development in competition with other farm lands. Under these circumstances, the settler should be willing to pay what these lands are worth in order to prove his worthiness to participate in an organized program of development.

(f) The Need for Increasing the Requirements for Patent

(Statements to support Agricultural Use Recommendation 6on P18).

1. The objective in selling land for agricultural purposes is to establish a commercial, not a subsistence type of farm economy. This objective cannot be attained from a farm holding with only 15 acres of improved land (at present, to obtain a patent to Crown lands, 15 acres must be cleared and cultivated).

2. With the aid of modern land-clearing equipment and government assistance for breaking and clearing, the present requirement of 15 acres of improved land is woefully out-of-date.

3. Anyone in earnest about making farming his lifework does not desire to spend more than 10 to 15 years in establishing a productive farm unit, i.e. one with at least 100 acres of cleared and developed farm land.

4. The evaluation of forest land and the program of woodlot management be designed:-

(i) to emphasize the fact that the forested portions of a farm holding are invaluable assets, and

(ii) to bring into production those lands within these holdings which have low agricultural use capabilities.

(g) The Need for Rural Small Holdings

(Statements to support Agricultural Use Recommendation 7 on P 19).

1. The majority of locatees at the present time take up a Crown lot of 75 acres in order to obtain a cheap place to live which is as close as possible to some off-the-farm occupation. Formerly, when lots were well forested, the locatees obtained a lot for woodcutting and generally remained on the lot until the merchantable timber was gone.

2. There are many cases where 75 acres of the best potential farm lands have been withdrawn from agricultural production because persons who desired a small holding had no alternative but to obtain a patent to 75 acres, by complying to the letter of the Lands Act.

3. The establishment of small holdings on patented lands has been proceeding for some years past in this area; the need for such holdings has therefore been demonstrated.

4. To restore the forests on accessible areas and to tend and harvest forest crops on the entire farm-forestry management unit, forest workers will be required. Some of these will prefer to live in rural subdivisions where they will be able to have a garden and keep a cow.

5. These subdivisions of rural holdings should be an integrated part of the rural community in order that adequate rural services be provided and that the residents participate in community life.

(h) The Need for Integration of Drainage Programs

(Statements to support Agricultural Use Recommendation 8 on P 19).

1. Improvement of drainage on both a regional and a farm basis is a major need in the Cochrane Clay Belt.

2. Except for the main rivers, the streams are sluggish and large municipal ditches are needed for areas under agricultural development.

3. Farm ditches are required on most lands. Even the best drained areas have local areas which require ditching. The release of water from these ditches into adjacent low lying areas reduces forest growth on these areas and aggravates the regional problem of soil waterlogging and peat accumulation.

(i) The Need for a Readjustment of the Glackmeyer Agricultural Land-Use Plan following a Statement of Requirements for Land for Agricultural Development by the Ontario Department of Agriculture

(Statements to support Agricultural Use Recommendation 9 on P19).

1. The Agricultural Land-Use Plan was based on the initial assumption that 100 farm units fully established by the year 1980 would be a satisfactory objective in the Glackmeyer Development Area, providing similar developments were planned for selected areas elsewhere in the Cochrane Clay Belt.

2. The area-time schedule based on the initial proposition outlined in No. 1 above is presented in order that the Department of Agriculture may have a local example for analysis at the regional level.

3. The statement by the Department of Agriculture of their requirements of land for agricultural development in the Cochrane Clay Belt in the next 100 years should provide data which will indicate adjustments either of time or of area, or of both, in the schedule planned for Glackmeyer(See pages 33 to 36).

(j) The Need for Detailed Land Classification of Crown Lots

(Statements to support Agricultural Use Recommendation 10 on P20).

1. The method used in the classification of lots for this report was to examine selected portions of the area in considerable detail in the field and to extend the areal application of these findings through aerial photographic interpretation.

2. The work of the subcommittee on the 20-lot pilot area is small in comparison with the detailed knowledge accumulated by the soil and forest site specialists over the past fifteen years.

3. In spite of the amount of knowledge accumulated and of the facilities which aerial photographs provide in extending this knowledge area-wise, a detailed inspection of lots for an agricultural land classification is necessary. The following is an example of the limitations to air photo-interpretation for agricultural use:

Stoniness

Although differences in the probability of the occurrence of stone within broad ranges can be mapped from aerial photos, a detailed ground inspection is required. For example, stoniness is a common characteristic of the clay-capped kames. To designate all areas as stony would remove from agricultural development some of the best land in the area. The ratings assigned to these areas on the maps are the closest approximation based on available knowledge.

4. In order that the spirit which the Agricultural Land-Use Plan represents be carried out to the letter, the detailed classification of the Crown lots before sale should not be neglected.

(k) The Need for Agricultural Land Classification and Farm Planning on Farm Units

(Statements to support Agricultural Use Recommendation 11 on P20).

1. Considerable variations in the capability of the land for agricultural development and production occur within short distances.

2. Soil survey maps, showing apparently homogeneous areas of one soil type for the whole or large part of a farm unit, do not provide adequate information for farm planning.

3. Although a number of combinations of conditions may result in the same farm production and hence may be classified as the same capability class, it is essential that these variations be examined and described for each farm.

4. The criteria used by the Department of Agriculture to establish agricultural use capability classes elsewhere in the province must be carefully reviewed in order to establish classes suitable for the Cochrane Clay Belt.

(l) The Need for Productivity Studies of Farm Crops

(Statement to support Agricultural Use Recommendation 12 on P20).

1. Information is needed regarding the variations in the production and yields which result when specific soil improvement practices are employed on the various clay soils which differ in such characteristics as:-

(i) Potential for surface drainage,

(ii) Depth and degree of decomposition of the peat horizon,

(iii) Depth and structure of the clay-pan glei horizon,

(iv) Depth to free lime.

(m) The Need for an Economic Appraisal of the Future Requirements for Land for Agricultural Development which is Based on a Physical Land Classification

(Statements to support Agricultural Use Recommendation 13 on P21).

1. To assist in regional and local planning of land use, an economic appraisal of the land which will be required for future agricultural development must be based on a physical land classification.

2. In order that this basis can be used by the economists, the potential of each physical land class for crop production must be established by the agronomists.

(4) Recommendations Regarding Agricultural Use of Land

Subsection C and the preceding parts of subsection D present an outline of the background essential in understanding the objectives of the following agricultural use recommendations. Subsection C outlines the problems of land use in the Cochrane Clay Belt. Parts 1 and 2 of subsection D localize these problems within the pilot area. Although part D (3) presents specific needs related to specific recommendations, some of the statements support more than one recommendation. Furthermore, each of the recommendations is supported by both specific and general statements. Therefore, since each specific need must be viewed as part of the whole problem, it is essential that all the requirements are recognized before a consideration is given to any specific recommendation.

Agricultural Use Recommendation 1 -- Initial Consolidation of Agricultural Development.

1.1 Restriction of agricultural development in the initial period of development to the area designated for primary agricultural development. (See Map No. 11).

1.2 Order of development of farm units within a multiple use area should be based mainly on the agricultural potential of the land but with due regard to present development of the farm units, present rural services and the consolidation of the community.

1.3 Controls to direct this consolidation to the best lands within the primary area should include:-

(i) the policy of granting land to settlers, (see recommendations 4, 5 and 6 which follow),

(ii) assistance policies to bona fide farmers.

(See part 3(a) on page 7 for specific statement supporting this recommendation).

Agricultural Use Recommendation 2 -- Reserves for Future Agricultural Settlement.

2.1 Areas which have a moderate to high proportion of the better agricultural lands and which have been settled (though sparingly improved for farming), and which are still served in part by roads should be reserved for future agricultural development and designated as secondary and tertiary.

2.2 Areas of secondary agricultural development to be differentiated from the tertiary areas on the pattern of agricultural use capabilities, present farm development and location in relation to towns, main highways, etc.

2.3 Blocks of potentially good agricultural land lying within the farm-forest area (see diagram on page 32) established by the regional committee but designated as "not presently required for agriculture" in the Agricultural Land-Use Plan (Map No. 6), should be incorporated in a Forest Management Plan envisioning at least two forest rotations.

(See part 3(a) on page 7 for specific statement supporting this recommendation).

Agricultural Use Recommendation 3 -- The District Inter-Departmental Committee.

3.1 For the purpose of integrating the activities of the agencies assisting in the development of agricultural communities following the recommendations made in this report, a District Inter-Departmental Committee should be formed and should meet as required and at least quarterly.

3.2 The committee to modify, where necessary, the detail of the Agricultural Land-Use Plan in such matters as the sale of Crown lots to form satisfactory farm units.

3.3 The committee to be responsible for the screening and guiding of guiding of applicants for Crown land, to ensure the adequate development of land for farm, forestry and wildlife crops.

3.4 The committee to deal with problems integrating forestry and wildlife land use with that of farming.

3.5 The committee to consist of the District Forester, the Agricultural Representative(s), a Land-Use Specialist who will represent the Regional Forester. Additional pro tem members, if necessary, will be appointed by the committee.

3.6 Following a statement by the Department of Agriculture regarding the land required for future agricultural development, the committee will re-examine the area-time schedule established for the Glackmeyer Development Area and make the necessary adjustments.

(See parts 3(a) and (b) on page 7 for specific statements supporting this recommendation).

Agricultural Use Recommendation 4 -- Size of Grants to Agricultural Settlers.

4.1 A farm unit to be defined as an area of 300 acres in nine mile townships or 320 acres in six mile townships, of which at least 1/3 are of the best and second-best land in the Cochrane Clay Belt (Agricultural Use Capability Classes A and B) and not more than 1/4 of the poorest land (Classes E, F and G).

4.2 Legislation providing for the disposal of land for agricultural settlement in the Cochrane Clay Belt be drafted to permit the granting of 300 acres (320 acres) to new settlers. Provision should be made to permit the present bona fide farmers to increase their present holdings to 300 acres (320 acres). The annexation of the additional area to follow the Agricultural Land-Use Plan, modified where necessary by the district inter-departmental committee.

(See part (d) on page 10 for specific statements supporting this recommendation).

Agricultural Use Recommendation 5 -- Rates for Crown Land Sold for Agricultural Purposes.

5.1 The basic Crown charges for approved farm units and annexed lots to be $5.00 per acre.

5.2 The value of farm improvements to be assessed by the Agricultural Representative on the local inter-departmental committee, using ratings established by the Department of Agriculture.

5.3 The Department of Lands and Forests representatives on the district inter-departmental committee to evaluate:-

(i) the standing timber on all parts of the farm unit,

(ii) the tree reproduction on those portions not required for clearing, breaking and pasturing (as determined by the local inter-departmental committee).

(See part (e) on page 11 for specific statements supporting this recommendation).

Agricultural Use Recommendation 6 -- Requirements for Patent of Agricultural Land.

6.1 Initial payment of 1/3 of the total payment, less cost of established tree reproduction (as outlined in Recommendation 5).

6.2 A 10-year agreement to be the initial form of tenure of farm holdings. This agreement may be renewed for a further 5-year period.

To secure patent on the whole units, the locatee must during the period of the agreement:-

(i) Have under cultivation, according to a crop rotation plan, 100 acres of land.

(ii) Erect buildings valued at 80% of the value of this land (100 acres), the latter as appraised by the Ontario Department of Agriculture.

(iii) Possess a minimum of 20 animal units.

(iv) Follow a prescribed program of forest management as outlined on the farm management plan (see Agricultural Use Recommendation 11.3).

(See part (f) on page 11 for specific statements supporting this Recommendation).

Agricultural Use Recommendation 7 -- Rural Small Holdings.

7.1 A small holding be defined as an area of not more than 10 acres and not less than 2 acres for the purpose of establishing a home and garden, or a commercial site.

7.2 The minimum frontage for small holdings to be not less than 100 feet; the maximum frontage for home and garden not to exceed 300 feet; the maximum frontage for a commercial site not to exceed 600 feet.

7.3 Legislation should be provided for the sale of small holdings:

(i) By permitting the subdivision of suitably located Crown land into small holdings. The sale price and requirements for patent to be based upon location and use to be made of the holding.

(See part (g) on page 12 for specific statements supporting this recommendation).

Agricultural Use Recommendation 8 -- Regional and Farm Drainage.

8.1 Overall drainage scheme to be laid out by the Department of Public Works in consultation with the District Inter-Departmental Committee who will designate the blocks of land to be serviced during the various periods of development.

8.2 Drainage subsidies to farmers should be integrated within the overall drainage scheme.

(See part (h) on page 12 for specific statements supporting this recommendation).

Agricultural Use Recommendation 9 -- The Basis for the Economic Appraisal of Future Requirements for Land for Agricultural Development Based on a Physical Land Classification.

9.1 A statement of the requirements of land for agricultural use should be made in terms of land-use capability classes with reference to the type of development and management practices for each of the major natural land units.

(See part (i) on page 13 for specific statements supporting this recommendation).

Agricultural Use Recommendation 10 -- The Detailed Classification of Clay Belt Areas to Establish Farm and Forestry Units.

10.1 The Department of Lands and Forests to classify in detail the lands of primary, secondary and tertiary areas to establish the farm units to be sold for future agricultural development (see Agricultural Use Recommendation 9.1) and to plan for forest management of lands not immediately required for agriculture.

(See part (j) on page 13 for specific statements supporting this recommendation).

Agricultural Use Recommendation 11 -- Land Classification and Farm Planning of Farm Units.

11.1 The Department of Agriculture to make a detailed classification of soil and other significant features of farm units to provide the data required to prepare farm management plans for these units. The farm units dealt with in this recommendation are:-

(i) presently patented units, when such plans are requested by the owner,

(ii) all other farm units to be established in the future.

11.2 Each farm management plan to be accompanied by an interpretation of the findings of research in crop productivity recommended below.

11.3 Each farm management plan to provide for forest management on a suitable portion of the unit as determined by the Department of Lands and Forests.

(See part (k) on page 14 for specific statements supporting this recommendation).

Agricultural Use Recommendation 12 -- Productivity Studies of Farm Crops.

12.1 Studies should be initiated by the Department of Agriculture to assess the variability of the productivity of the land for farm crops.

12.2 These studies should be based on natural land units defined in terms of stable physiographic features, such as combinations of slope, soil materials and stable soil horizons, in order to assess the significance

of changes in the less stable soil features (such as type of humus) brought about through improvement of the land by farming.

12.3 The productivity levels recorded in these studies should be stated in terms of the management practices (the techniques and costs of management) which are required to attain these levels on the natural land units in the Cochrane Clay Belt.

(See part (1) on page 14 for specific statement supporting this recommendation).

Agricultural Use Recommendation 13 -- Readjustment of the Agricultural Land-Use Plan Following a Statement of Requirements for Agricultural Land by the Ontario Department of Agriculture.

13.1 The District Inter-Departmental Committee, working in co-operation with the Regional Inter-Departmental Committee, should readjust the area-time schedule of the Glackmeyer Development Area upon receiving a statement of requirements from the Departments of Agriculture and of Lands and Forests as recommended in Agricultural Use Recommendation 9 above.

13.2 In the case of the Glackmeyer Development Area, a consideration of changing the time schedule rather than the area boundaries is recommended.

(See part (m) on page 15 for specific statements supporting this recommendation).

## E. An Outline of Forest Land Use in the Glackmeyer Development Area

### (1) Summary of the Forest Land-Use Plan

After the limits of expansion of the agricultural community of the Development Area had been designated in the Agricultural Land-Use Plan, the Forest Land-Use Plan was drafted to provide a framework for the forest management of the remaining lands of the Development Area. Various levels of intensity of management were planned for these lands depending upon the length of time which is likely to elapse before they are required for agriculture.

In the forestry plan seven classes of forest properties are considered. These classes are based upon:-

(i) the relative length of time each class can be managed for forest production,

(ii) the function of the class of forest property,

(iii) the productivity of the class of forest property.

Seventeen permanent forest units are planned. On each of these units a farm-forest worker will eventually obtain a sustained annual income from the forest which will be comparable to the income of the established farmers of the area. Five interim units have been planned. After these interim units have been brought into full production, they will provide farm-forest workers with an income comparable to that obtained from permanent forest units for a period of 3 to 4 decades. After this time, however, it is probable that the forests will be liquidated and the land developed for agriculture. Crown forests, protective forests, and wet land forests will provide additional income to the farm-forest workers.

(2) Statements Supporting the Forest Use Recommendations

(a) The Need for Increased Forest Management on Lands which are Not to be Developed Immediately for Agriculture
(Statements to support Forest Use Recommendation 1 on P25).

1. A farm-forest economy is needed:-

(i) to provide the residents of the Development Area with a satisfactory standard of livelihood,

(ii) to exploit, adequately, the potentialities of the land.

Up to the present, returns from the forests have been obtained by harvesting mature stands, with no effort expended on their management. Thus to preserve the farm-forest economy of the Development Area, the cut-over forest lands must be rehabilitated and areas of second-growth forest must be managed to attain a sustained production from them.

2. There has always been a group of workers in the Development Area who have derived their livelihood from the forest. It is contemplated that the woodcutters of the former exploitive forest economy will become the farm-forest workers of a restorative forestry program. The planning of sustained production from forestry units and Crown forests will be a measure of assistance to these farm-forest workers which is comparable to the assistance recommended in this plan for the farmers of the Development Area.

3. The need for forest management cannot be measured solely in terms of the net returns from the forest properties which are managed. Three further considerations emphasize the need for forest management:-

(i) A large segment of the national economy will continue to be dependent on the supply of forest products. The value of forests in maintaining and strengthening this segment of the economy is far greater than their value in terms of the balance sheets of individual forest properties.

(ii) The productivity of forest lands must be maintained or improved.

(iii) National welfare considerations indicate a growing need for forests. The recreational value of forest will become increasingly important as changes in the industrial arts increase leisure time for the masses.

(b) The Need for the Establishment and Management of Protective Forests

(Statements to support Forest Use Recommendation 2 on P25).

1. Although erosion is not as serious a problem in the Development Area as in many areas of the Province, the steeply sloping banks of the larger rivers are subject to erosion. Protective forests are therefore needed along the banks of the Frederickhouse and Abitibi Rivers.

2. In addition to the problems of gullying and slumping of banks, which are caused by erosion, as indicated in Research Supplement III, erosion often exposes very high lime soil materials. These very high lime 'soils' are difficult to plant and natural vegetation is slow to become established on them.

(c) The Reason Why Wet Land Areas are Established

(Statement to support Forest Use Recommendation 3 on P26).

1. Wet land areas are composed of sites which are biologically inactive. The productivity of these areas in terms of both forest and wildlife crops is very low. The wet land areas were thus segregated from the productive forest areas and were considered to be areas of minor significance in the Wildlife Plan. Some of these wet land areas may eventually be developed and managed for forest production, but not until

there is a great change in the economic pressure for forest lands.

(d) The Need for the Crown to Acquire the Patented Lands of the Permanent and Interim Forestry Units
(Statements to support Forest Use Recommendation 4 on P26).

1. There are about 16 patented and located lots in permanent and interim forestry units which should be acquired by the Crown. These lots should be acquired because the land will remain in forest long enough that it would be in the public interest to acquire them for forest production.

2. With the exception of the five patented or located lots of Block D (see Map No. 9), the privately owned lots to be acquired for forestry have a much lower agricultural use capability than the potential farm units of Block A. Thus it would be to the advantage of the owners of most of these lots to relocate on potential farm units in Block A, since potential farm units of Block A are without exception closer to markets and to the established farm community and are thus more suitable for agricultural development.

(e) The Need for Maintaining Existing Cleared Lands
(Statement to support Forest Use Recommendation 5 on P26).

1. If the clearing of the reserved agricultural areas, which are not being cultivated, are not maintained, they will revert to scrub and hardwood growth. When these areas are developed for agriculture, the removal of this scrub cover will be almost as difficult and as costly as the removal of second-growth forest cover.

(f) The Need for Access Roads for the Primary Forestry Area
(Statement to support Forest Use Recommendation 6 on P27).

1. To manage the forests of the Primary Forestry Area (Block D) at a level of intensity which will ensure sustained production from these lands, a system of roads will be needed for the area which will provide access to all of the forestry units. The need for roads in this area, therefore, is a first phase of intensive management.

(g) The Need for a Program of Extension Forestry

(Statement to support Forest Use Recommendation 7 on P27).

1. There is a need for a program of extension forestry to advise and assist farmers in the establishment and management of farm woodlots. This need will assume larger proportions as the potential farm units are developed for agriculture.

(3) Recommendations Regarding the Forest Use of Land

Forest Use Recommendation 1 -- Increased Forest Management Program for Lands which are Not to be Developed Immediately for Agriculture (See Map No. 9).

1.1 The establishment and management of permanent forestry units where the forests may be managed for at least two forest rotations.

1.2 The establishment and management of interim forestry units where the forests may be managed for at least one forest rotation.

1.3 The establishment and management of full-term Crown forests on the primary agricultural area where the forests may be managed for at least one forest rotation, but where the area of such lands is not sufficient to permit the establishment of interim forestry units.

1.4 The establishment and management of half-term Crown forests in the primary and reserve agricultural areas where the forests may be managed for half a forest rotation.

1.5 The establishment and management of quarter-term Crown forests in the primary and reserve agricultural areas where the forests may be managed for a quarter of a forest rotation.

(See part 2(a) on page 22 for specific statements supporting this recommendation).

Forest Use Recommendation 2 -- The Establishment and Management of Protective Forests.

2.1 The establishment of protective forests and management of these forests with an objective of:-

(i) protecting river and stream banks from erosion,

(ii) maintaining suitable habitat conditions for wildlife, and

(iii) providing for recreational land use where and when required.

2.2 The Department of Lands and Forests to manage the protective forests. Timber to be cut from protective forests will be marked by the Department and offered for sale by tender to the farm-forest workers of the Development Area.

(See part (b) on page 23 for specific statements supporting this recommendation).

Forest Use Recommendation 3 -- The Establishment of Wet Land Areas.

3.1 Portions of the Development Area which are designated in the forestry plan as wet lands will be cropped for naturally developed wildlife crops, but will not be managed for forest production because the returns from management would not offset management costs.

(See part (c) on page 23 for specific statement supporting this recommendation).

Forest Use Recommendation 4 -- The Acquisition by the Crown of Patented Lands of Premanent and Interim Forestry Units.

4.1 Lands of the permanent and interim forestry units which have been patented or located, should be acquired by the Crown.

(See part (d) on page 24 for specific statements supporting this recommendation).

Forest Use Recommendation 5 -- The Management and Maintenance of Cleared Lands until Required for Agriculture.

5.1 Cleared areas of more than 30 acres in the reserve agricultural blocks (Blocks B and C of the Multiple Land-Use Plan) which are not now being cropped be managed in such a manner as to maintain the clearings.

(See part (e) on page 24 for specific statement supporting this recommendation).

Forest Use Recommendation 6 -- All-Weather Access Roads for the Primary Forestry Area.

6.1 That 4 miles of road be built immediately by the Department of Lands and Forests to provide access to the portion of the primary forestry area which is unalienated Crown land.

6.2 That 18 miles of road be built by the Department of Lands and Forests when the licensed areas are abandoned to provide access to the remainder of the primary forestry area. As indicated in Section III, these licensed areas will probably be abandoned within the next five years.

(See part (f) on page 24 for specific statement supporting this recommendation).

Forest Use Recommendation 7 -- Enlargement of the Extension Forestry Program.

7.1 An immediate program of extension forestry to be undertaken by the Department of Lands and Forests to assist the farmers of presently established and partially developed farm units who wish to establish woodlots or manage their present woodlots.

7.2 A future program of extension forestry to be undertaken by the Department of Lands and Forests to assist new farmers in the management of their woodlots.

(See part (g) on page 25 for specific statement supporting this recommendation).

## F. An Outline of Wildlife Land Use in the Glackmeyer Development Area

### (1) The Need for a Wildlife Land-Use Plan

Wildlife resources played a very great part in the early exploration and development of North America. These resources have been specifically retained in public ownership. Accordingly, they are part of our heritage and must be considered on all lands, regardless of the ownership of the land. In this plan, wildlife is defined as all animals, including mammals, birds and fish, which may occur in their natural, free and undomesticated state.

There is a portion of the Glackmeyer Development Area (about 15% of the total area) on which wildlife is (and should continue to be) the main crop produced. This does not mean, however, that these will be the major wild-

life producing areas, for indeed it is often found that the principal crops of wildlife are produced as by-products of other land uses. The potential production of wildlife is related to the potential of the land for both agriculture and forestry. It is pointed out, in Section IV, that on these better lands, wildlife management must be planned to fit the plans for the major land use. Accordingly, a land-use plan is required to introduce those practices that will develop the wildlife use of land so that it will complement the major land use on more productive lands. The Wildlife Land-Use Plan is also required to develop and maintain the productive capacity of 'waste' lands.

(2) Recommendations Regarding the Wildlife Use of Land

Wildlife Use Recommendation 1 -- Provision for Use.

1.1 Provision must be made to permit adequate use of wildlife species. Wildlife use on Crown land by the general public must be assured (although perhaps regulated) and for this reason, non-agricultural and non-residential lands should remain in the Crown.

Wildlife Use Recommendation 2 -- Control of Water.

2.1 All open surface bodies of water, including streams, should be retained in the Crown and a Crown controlled protective forest of at least 50 feet on either side of streams and rivers, and at least ~~499~~ 498 feet from the shore line of all lakes, should be established. Exceptions to this should only be permitted where this forest may interfere with use of adjacent lands, e.g. planned municipal drainage schemes.

2.2 Commercial and private use of water must be permitted but should be controlled so that clean water is available to all persons.

Wildlife Use Recommendation 3 -- Further Investigation.

3.1 It is recommended that a complete survey of all water resources be made. This survey should include inventory and classification of water according to present wildlife species and water use, as well as potential for wildlife species and use. Investigation of all forms of water use should be completed and a detailed plan of water management prepared.

Wildlife Use Recommendation 4 -- Implementation.

4.1 Implementation of these recommendations (particularly #1 and 2) should be under the jurisdiction of the inter-departmental committee provided for in the Agricultural Use Recommendations and the Multiple Land-Use Plan.

G. An Outline of Recreational Land Use in the Glackmeyer Development Area

(1) The Need to plan for the Recreational Use of Land

Based on the patterns of land use in the United States and Southern Ontario, experience has shown that when the realization of a need for recreational areas is felt, suitable areas for this type of development are either lacking or must be bought from private individuals at unrealistic prices.

Therefore, any land-use plan for agricultural, forest and wildlife management should also include a plan for the recreational needs of the community. Suitable areas which are now vested in the Crown should be reserved for recreational development before the need arises.

Since the regional needs for recreational facilities are being provided by the Provincial Park Program, it is the opinion of this committee that provision in the Glackmeyer Area should be restricted to:-

(i) Parkettes, permitting picnicking and access to preferred lakes,

(ii) Cottage sites,

(iii) Additional areas which will have a use other than recreation.

(2) Recommendations Regarding the Recreational Use of Land

Recreational Use Recommendation 1 -- Parkettes.

1.1 Certain areas should be reserved for development as picnic sites. These areas will have a major recreational use but could also be considered as having a minor use for forest management, watershed control, or wildlife management.

Recreational Use Recommendation 2 -- Cottage-site Reservation.

2.1 A reserve, 400 feet in depth, for cottage-site development should be made on suitable lakes. These areas will be primarily for recreational use, but their wildlife and pro-

tective forest use must not be ignored.

Recreational Use Recommendation 3 -- Additional Areas.

3.1 Other areas which have been classified on the Multiple Land-Use Map as protective forest or wildlife management areas, will be retained in the Crown and will provide additional recreational areas when needed.

Recreational Use Recommendation 4 -- Purchase.

4.1 That the Crown acquire all land designated for primary recreational use on Map No. 10.

## H. The Urban-Suburban Land-Use Plan

### (1) The Limited Objective

The committee did not attempt to develop an Urban-Suburban Land-Use Plan. It was deemed advisable to make tentative reservations for a five-fold expansion of the Town of Cochrane in order to draw attention to the need of such reservations and to make the other plans more realistic. This reservation is shown on the Multiple Land-Use Plan (Map No. 11). Also indicated on this map are areas suitable for subdivision into small rural holdings which meet the requirements of the Multiple Land-Use Plan.

### (2) Recommendations Regarding Urban-Suburban Land Use in the Glackmeyer Development Area

Recommendations for Town Planning

It is recommended that a qualified organization prepare a plan for the expansion of the Town of Cochrane and to indicate to the agency which is implementing the Glackmeyer Land-Use Plan what modification, if any, of the present reservations should be made.

Recommendations for Rural Subdivisions

It is recommended that the municipality of Glackmeyer in co-operation with the Town of Cochrane Planning Group prepare plans for the subdivision of suitable areas such as those suggested in the Multiple Land-Use Plan. Consultation with the inter-departmental committee implementing the Glackmeyer Land-Use Plan is also recommended in order that the subdivision plan is integrated with the Multiple Land-Use Plan.

## I. Interpretation of the Glackmeyer Multiple Land-Use Plan for Regional Planning

### (1) Glackmeyer, a Reference Area Representative of Land-Use Problems in the Settlements of the Cochrane Clay Belt

The primary objective of the Glackmeyer subcommitee was to obtain data in the pilot area which would illustrate the problems and principles involved in planning land use in the farm-forestry area of the Cochrane Clay Belt. This is the farming and forestry settlement area proposed by the Northern Region Land-Use Planning Committee in Progress Report No. 1.

In addition to serving as a reference area for all agricultural settlement areas, the pilot area is also representative of areas in which a primary type of forestry may be introduced, particularly on lands with a good forest potential but which require effort in establishment. Some of the Glackmeyer problems in forest management will not be found beyond the limits of man-handled settlement lands. Other forest problems will be similar to many which occur throughout the entire Clay Belt.

Similarly problems in wildlife management on the Glackmeyer Development Area will represent those which occur both on settlement and on concession areas throughout the entire Clay Belt, except for broad areas of black spruce flats and muskegs. However, there are no typical areas of major wildlife land use in the Glackmeyer Development Area.

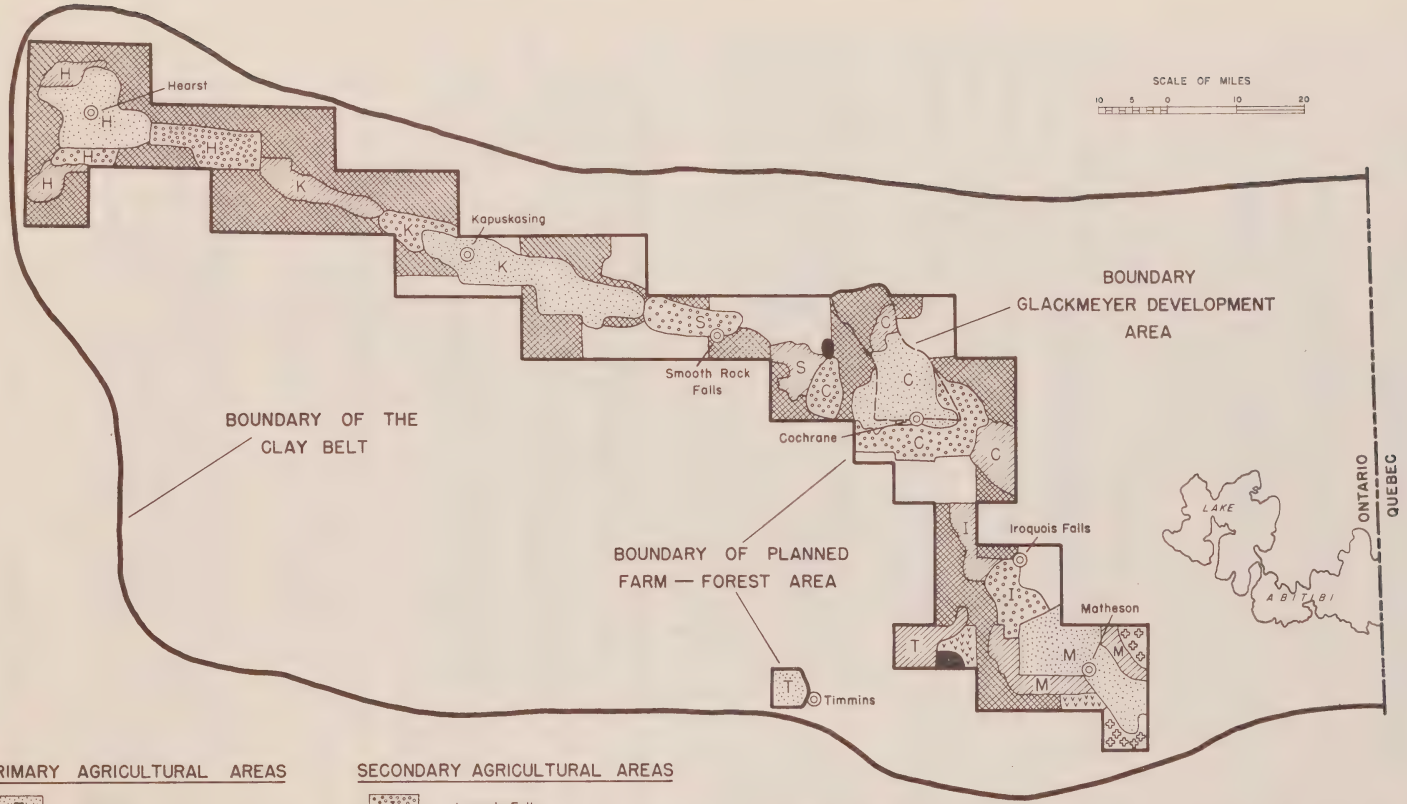
The limited recreational land use in the Glackmeyer Development Area is also typical of the Clay Belt Proper. However, the major areas of primary recreational land use in the Northern Region lie in the sand and lake regions beyond the boundaries of the Cochrane Clay Belt, but local sand plains with kettle lakes occur sparingly within the Clay Belt boundaries. Because of their proximity to the settlements, these areas possess a high recreational value.

It is apparent that for areas where forestry, wildlife management or recreation is the dominant land use, three other types of pilot areas are needed for the region.

Diagram 1 illustrates the extension of the Glackmeyer Multiple Land-Use Plan to the entire Cochrane Clay Belt. Areas of primary, secondary, tertiary and quaternary agricultural development are broadly indicated. Areas of which the Glackmeyer Development Area is not representative are also indicated, for example:-

(i) Areas under license (no settlement, roads, clearings, etc.).

CHART SHOWING EXTENSION OF THE GLACKMEYER MULTIPLE LAND USE PLAN
TO THE FARM — FORESTRY AREA OF THE COCHRANE CLAY BELT




**PRIMARY AGRICULTURAL AREAS**

| | |
|---|---|
| T | Timmins |
| M | Matheson |
| C | Cochrane |
| K | Kapuskasing |
| H | Hearst |

**SECONDARY AGRICULTURAL AREAS**

| | |
|---|---|
| I | Iroquois Falls |
| C | Cochrane |
| S | Smooth Rock Falls |
| K | Kapuskasing |
| H | Hearst |

**TERTIARY AGRICULTURAL AREAS**

| | |
|---|---|
| T | Timmins |
| M | Matheson |
| I | Iroquois Falls |
| C | Cochrane |
| K | Kapuskasing |
| H | Hearst |

**OTHER-USE AREAS**

- Primary Forestry Areas (Quaternary Agriculture)
- Company Concession Areas
- Primary Forestry Areas (non-agricultural)
- Provincial Parks
- Potential Recreation Land

(ii) Areas of sand and lakes suitable for primary recreation use (provincial parks and potential recreation areas).

(2) The Extension of the Agricultural Land-Use Plan

(a) The Basis

The Glackmeyer Agricultural Land-Use Plan was established on the basis that 100 fully established farm units would be required in that area in the next period of development (by the year 1980).

Fully established farm units are those which under present conditions produce a gross revenue of at least $5,000. However, in the estimate of present farm establishments, partly established units are included which have a range in a gross farm revenue from $1,000 to $5,000. This classification of farm units differs from that presented in the 1957 census where anyone who spends part of his time on the farm is a farm operator. Table 1 presents a comparison of the two estimates. The somewhat higher rates of commercial farmers to 'farm operators' in the Glackmeyer Development Area is explained by the better-than-average development of farms in the Glackmeyer Area.

Table 1

NUMBER OF FARM OPERATORS AND FARMERS IN THE COCHRANE CLAY BELT

| Area | Farm Operators (Living on Farms) | Full-time Farmers (Living from Farms) | |
|---|---|---|---|
| Glackmeyer | 279 (Glackmeyer survey) | 47 | 17 % |
| District of Cochrane | 1,772 | 225 | 13 % |

(b) The Proposal

The expansion of agricultural development is dependent upon increased markets, not only locally but regionally, nationally and internationally. Diagram 1 on page 32 presents the regional problem by indicating the four other Clay Belt areas, similar to the primary agricultural area of Glackmeyer. It is recommended (see page 34) that agricultural experts evaluate production requirements of the immediate future in the Clay Belt and apportion these to the five areas designated. This establishment of an agricultural policy will provide the basis for detailed work in these areas, similar to that on Glackmeyer.

Similarly, five secondary and six tertiary areas have been indicated in order to suggest a method of timing the agricultural development of the Clay Belt.

In addition to the five centres which are now surrounded by a sufficient number of well-developed farms to warrant their designation as primary areas, there are two other centres, namely Iroquois Falls and Smooth Rock Falls, around which there are lands which are not sufficiently developed to be so classified but which are suitable for development in the future. These areas, although now classified as secondary areas, may be considered to have a higher priority and accordingly could be developed into primary areas before proceeding with a similar development in other secondary areas.

Table 2 is an interpretation of the way in which a knowledge of the variations in agricultural potential and present farm development of the areas, shown in Diagram 1, may be used to establish a policy of agricultural settlement for the Cochrane Clay Belt.

This is a very optimistic estimate of the progress which agricultural development will make in the next century. As indicated by the Glackmeyer studies, agricultural development has been merely a consolidation of farm effort on those lots taken up before 1920, a period of national prosperity. An authority on economic trends suggests that, by 1966, Canada will have gone through a similar period of expansion so that the number of farm units established by 1980 could very well indicate the extent of agricultural expansion for another half-century. It is doubtful then if the number of farmers will equal the present number of farm operators (1956 census) even in another century. This, of course, is too far in the future to make any sure predictions. It is essential, however, to make a realistic evaluation of progress as indicated by present development.

(c) Recommendations Regarding Regional Planning of Agricultural Land Use

Regional Agricultural Use Recommendation 1

1.1 That the Ontario Department of Agriculture indicate the location and extent of land required for settlement in the Cochrane Clay Belt.

1.2 That Diagram 1 and Table 2 be used as a model to facilitate further detailed work.

Regional Agricultural Use Recommendation 2

2.1 The Department of Lands and Forests make provision for land grants to facilitate the extension of the Agricultural Use Recommendations 4, 5, 6, 7 and 10 throughout the Cochrane Clay Belt.

Table 2

ESTIMATED NUMBER OF PRESENT AND PROPOSED FARM ESTABLISHMENTS

| Areas of Agricultural Development as Indicated in Diagram 1 | Periods of Agricultural Development (Accumulated Totals) | | | |
|---|---|---|---|---|
| | 1910-1960 | By 1980 | By 2000 | By 2060 |
| Primary | | | | |
| Cochrane | 55 | 100 | 130 | 160 |
| Kapuskasing | 50 | 100 | 125 | 140 |
| Hearst | 30 | 80 | 100 | 110 |
| Matheson | 20 | 50 | 60 | 100 |
| Timmins | 25 | 30 | 40 | 50 |
| Secondary | | | | |
| Iroquois Falls | 5 | 10 | 25 | 50 |
| Smooth Rock Falls | 5 | 10 | 25 | 50 |
| Cochrane | 10 | 10 | 50 | 100 |
| Kapuskasing | 5 | 5 | 25 | 50 |
| Hearst | 5 | 5 | 50 | 60 |
| Tertiary | | | | |
| Matheson | 4 | 4 | 15 | 25 |
| Timmins | 3 | 3 | 10 | 50 |
| Iroquois Falls | 3 | 3 | 10 | 25 |
| Cochrane | 2 | 2 | 10 | 25 |
| Smooth Rock Falls | 1 | 1 | 10 | 25 |
| Kapuskasing | 1 | 1 | 10 | 25 |
| Hearst | 1 | 1 | 10 | 25 |
| TOTAL: | 225 | 415 | 705 | 1,070 |

2.2 The implementation of such provision should be consistent with the requirements outlined in Regional Agricultural Use Recommendation 1.

Regional Agricultural Use Recommendation 3

3.1 That an inter-departmental committee be established to deal with the regional planning of land use in the farm-forestry areas of the Cochrane Clay Belt.

Regional Agricultural Use Recommendation 4

4.1 That the Department of Lands and Forests classify in detail the lands of primary, secondary, and tertiary areas in order to establish the farm units to be sold for future agricultural development, and plan for forest management of lands not immediately required for agriculture.

Regional Agricultural Use Recommendation 5

5.1 That a detailed soil survey and farm management plan of all farm units be made by the Ontario Department of Agriculture as required.

(3) The Extension of the Forest Land-Use Plan

(a) The Major Forestry Areas

The quaternary agricultural areas of the Clay Belt shown in Diagram 1 are the primary forestry areas of the farm-forestry settlements. These primary forestry areas are similar to those of the Glackmeyer Development Area. The lands of these areas are relatively accessible; they are a pattern of relatively high forest use capability classes and they will be devoted to forest production for a sufficiently long period that an intensive level of forest management is practicable. It is within the primary forestry areas that the bulk of the permanent forestry units may be established and thus the forest of these areas will provide the major source of continuing income to the farm-forest workers of the settlement areas.

Forestry units and short-term Crown forests for the primary and secondary agricultural areas of the Clay Belt which are shown in Diagram 1 should be planned, using the methods worked out for the Glackmeyer Development Area.

The sections which follow outline the work which must be undertaken to develop a forest land-use plan for the farm-forestry area of the Cochrane Clay Belt (Diagram 1).

(b) The Cochrane and Matheson Areas

When an estimate was made of the lands required for agricultural development in the Glackmeyer Area and the potential forest productivity of the remaining lands was assessed, it was obvious that the long-term forest resources of the study area were limited. Only seventeen permanent forestry units could be established within the Development Area and consequently the area is capable of eventually supplying only seventeen farm-forest workers with an adequate sustained income from forest operations. Thus no attempt was made to assess the probable wood requirements of farm-forest workers.

The first task to be undertaken in the development of a forest land-use plan of the Cochrane and Matheson areas will be to assess the probable wood requirements of the forest workers of the areas for the period of the plan. Then a sufficient number of forestry units may be planned for the quaternary and other agricultural areas so that the additional units, together with the units already planned for the Glackmeyer Development Area, will supply the wood requirements of the farm-forest workers. Most of the additional units will be established in:-

(i) Kennedy Township and north-east corner of Glackmeyer Township,

(ii) Newmarket, McCart and Dundonald Townships,

(iii) Bond, Curry and Playfair Townships.

(c) The Kapuskasing and Hearst Areas

The long-term forest resources of the quaternary agricultural areas of Kapuskasing and Hearst must be investigated. An estimate must be made of the long-term wood requirements of the farm-forest workers of these areas and a plan to establish a sufficient number of permanent forestry units to supply these requirements must be formulated.

(d) The Timmins Area

The long-term forest resources of the portion of the Timmins area which lies in the Cochrane Clay Belt must be assessed. The wood requirement of the farm-forest workers of the area must be estimated and forestry units established to supply these requirements.

(e) Recommendations Regarding the Regional Planning of Forest Land Use

Regional Forest Land-Use Recommendation 1

1.1 That the appropriate Lands and Forests District organization develop forest land-use plans for the farm-forest settlements of Hearst, Kapuskasing, Smooth Rock Falls, Cochrane, Iroquois Falls, Matheson and

Timmins. To formulate such plans the following work projects are recommended:-

1.2 That an estimate be made of the long-term wood requirements of the farm-forest workers of the Cochrane Clay Belt.

1.3 That an assessment be made of the long-term forest resources of the farm-forest settlement areas of the Cochrane Clay Belt.

1.4 The planning of a sufficient number of forestry units in each farm-forest settlement to supply the wood requirement of the farm-forest workers.

Regional Forest Land-Use Recommendation 2

2.1 That a Regional Inter-departmental Committee be established (see Regional Agricultural Use Recommendation 3) to advise and assist the districts to formulate forest land-use plans and to integrate the plans for each settlement area.

(4) The Extension of the Wildlife Land-Use Plan

The Glackmeyer Development Area work demonstrates a method of multiple use planning based on assessment and classification of the numerous factors (and their interrelationships) which affect the ultimate land use. It is readily seen, then, that for the proposed settlement area, wildlife management must be integrated with other land uses and both uses and areas must be priority rated. The following suggestions are outlined to show how multiple land-use planning on the settlement area should be carried out based on the findings of the Glackmeyer study.

(a) Recommendations Regarding the Regional Planning of Wildlife Land Use

Regional Wildlife Land-Use Recommendation 1

1.1 That a complete water classification be carried out for the water resources of the Cochrane Clay Belt. This classification must be based on quantity, quality and distribution, not only for wildlife use, but for all other uses such as present and potential hydro development, industrial, municipal and private use.

Regional Wildlife Land-Use Recommendation 2

2.1 Having achieved the classification as outlined in Recommendation 1, it is recommended that the individual waters in the Cochrane Clay Belt be priority rated based on

(i) local and region distribution,

(ii) present and anticipated requirements for various water classes.

Regional Wildlife Land-Use Recommendation 3

3.1 That a wildlife management program be prepared for each body of water in the Cochrane Clay Belt.

Regional Wildlife Land-Use Recommendation 4

4.1 That once the speckled trout waters are designated, based on classification and priority rating as outlined above (1.1 and 2.1), the land surrounding these waters be reserved and sale of such lands be discontinued.

Regional Wildlife Land-Use Recommendation 5

5.1 That recommendations on Control of Water and Public Use as outlined in the Glackmeyer Land-Use Plan be adapted and applied in their entirety over the whole Clay Belt.

(5) The Extension of the Recreational Land-Use Plan

The somewhat limited type of recreational land use recommended for the Glackmeyer Development Area may be applied to all areas of dominantly clay lands in the Cochrane Clay Belt. Within the Clay Belt there are outliers of the sand and lake terrain which are similar to the more attractive recreational areas to the south. Two of these, viz. Greenwater Park and Kettle Lakes Park, provide camping and picnicking facilities for the residents of the eastern part of the Cochrane District as well as for tourists from other regions (see Diagram 1).

(a) Recommendations Regarding the Regional Planning of Recreational Land Use

Regional Recreational Land-Use Recommendation 1

1.1 That the present parks program of the Department of Lands and Forests be continued and expanded as the need arises.

1.2 That the recommendations of the district committee on recreational land-use planning be integrated within a regional multiple land-use plan.

1.3 That the recommendations for parkettes and other small recreational areas in the Glackmeyer Development Area be extended to apply to all areas of the Cochrane Clay Belt.

## J. An Outline of the Principles Used in Land-Use Planning

### (1) Land Use Determined by Natural Land Patterns

Land can be compared to a carpet which covers a large part of the surface of the globe. Into a warp of sand, silt, clay and undersurface water, the weft of climate is interwoven to form soil and vegetation patterns. These natural land patterns determine the crops which can be produced, not only crops harvested from the fields, orchards and pastures, but those produced in the forests, wildlands and streams. These land patterns control the yield and quality of the crops, although much also depends on how man co-operates with nature in the management of land. Just as the coat should be cut according to the cloth, so should land use be guided by natural land patterns. In addition to a consideration of local variations in the soil of a farm or a community, regions of multiple land use, consisting of natural groupings of patterns having similar qualities and uses, should be established to provide the broad framework for the development of the renewable resources.

It is not surprising that in so vast an area as Ontario with its 232,500,000 acres, stretching from the "Banana Belt" climate of Essex County to the semi-tundra of Northern Patricia, there are at least 11 multiple use regions of major importance. The one in which the Glackmeyer Development Area is situated, namely the Cochrane Clay Belt, possesses distinctive natural land qualities which create land-use problems which differ greatly from many of the other regions. The assumption of government and settler alike that this area could be developed similarly to Southern Ontario has resulted in much waste of effort and money, of both individual and state, and has caused much hardship to many settlers, particularly to those who made an honest attempt to develop a farm.

Even in Southern Ontario, long considered a region of primary agriculture, there are many areas where there is a pressing need for other major land uses such as forestry and wildlife management. It is, therefore, too much to expect that all of the Cochrane Clay Belt can be developed for primary agriculture and that those areas which are suitable will be developed immediately. The development of rural land-use patterns is an evolutionary process governed by a combination of factors, - physical (natural land qualities), economic and social, including institutional. It is the objective of the Glackmeyer Land-Use Planning Committee to assess, in detail, the land-use patterns of a restricted area in order to determine the progress made under present legislative control; and, in the light of this detailed study, to recommend the changes in these controls which are necessary to establish a multiple land-use pattern which is well adjusted to the natural qualities of the land, and which provide for orderly agricultural development to meet the needs of the future.

*This photo illustrates the interrelationship between landtype patterns and land-use patterns. A fully established farm has been established on the dominantly fresh sites of the drumlin in the background, whilst a second growth black spruce and larch forest with alder and willow shrubs occupies the transition moist to wet and wet sites of the inter-drumlin flat in the foreground. The effort and cost of developing the flats for agriculture would not be justified at present, yet the productivity of forests on these sites is sufficiently high that taking a long view it will be an asset to the farm as forest land.*

## (2) Two Approaches to Land-Use Planning

There are two approaches to land-use planning of broad areas. Firstly, a "mass action" approach may be organized which relies almost exclusively upon the office interpretation of aerial photos with a minimum of field reconnaissance. This approach will present, in very general terms, the present land-use pattern of the broad area surveyed. It will also indicate broad policies of recommended land use. However, because of lack of detailed information on basic ecology and land-use practices, the findings of this type of survey will have little or no application in the planning of land use and in the administration and management of land at the local level. Furthermore, the fundamental research which underlies this type of survey will be inadequate because the significance of the interrelationships of factors within local patterns cannot be adequately considered.

Secondly, there is an approach which begins with the establishment of local reference areas such as the Glackmeyer Development Area. On these, a detailed study is made of the interrelationships of the total complex of

factors which bear upon the problem of proper land use. After the reference areas are established, the scope of the survey is broadened by a program of landtype mapping within a framework of site regions. This approach recognizes, in the first instance, the significance of the interrelationships of the local factors of the reference areas, and secondly, the changing patterns of these local relationships over broad areas as expressed by landtype maps. The advantages of this second approach are:-

(i) The reference areas will provide data which are sufficiently detailed, and which are based upon interrelationships of factors which are sufficiently local in character, that they can be interpreted by local authorities in their work of land-use planning and land administration.

(ii) The reference area will provide a concrete illustration of land-use planning at the local level, and will also provide an illustration of the data which are required for land-use planning.

(iii) Landtype mapping, within a framework of site regions, will provide for the interpretation of significant interrelationships of factors on broad areas outside the reference areas. The landtype maps will indicate the limits of the area within which the interrelationships found in any reference area may be applied; it will also provide for an integration of the interrelationships found on the various reference areas.

There is in Canada to-day a growing awareness of the need for land-use planning. To be effective, such planning must be based upon a full knowledge of the interrelationships of natural and cultural features. Because the subcommittee felt that the second approach to land-use planning was the only means of acquiring such knowledge, it had, as its first objective, the presentation of a concrete illustration of this regional approach to land-use planning. If we have attained our objective, this illustration will show how regional land-use problems may be analyzed to establish the political, social and economic controls which are necessary to provide a satisfactory rural economy. Because the authority to establish these controls rests with the Provincial and Federal Governments in order that resource planning may develop into resource management, the subcommittee believed it to be most important that we provide these authorities with an example of the sort of knowledge which can be provided by regional workers to aid governments in establishing such controls.

Thus this report of the Glackmeyer Development Area will serve two groups of readers:-

(i) Those interested in this specific area. For these the report presents an analysis of the local problems in multiple land use together with recommended land-use plans (see maps and text).

(ii) Those concerned about the wise use of natural resources generally. For these the report illustrates a fundamental approach to land-use planning which has a broad application.

(3) Two Methods of Land Classification

There are two fundamentally different approaches to the problem of classifying lands in order to derive units of differing potentials for land use.

In the first, the single characteristic approach, each of the natural land features of an area is studied independently in order to define a number of absolute types (e.g. soil types, relief types, climatic types), each of which may be used to describe discrete areas of land. Each type is established solely on the characteristic of one specific feature and no attempt is made to recognize complexes of interrelated features. Thus a given station may be located within a number of type-areas whose boundaries are not necessarily coincident and for each of which a separate land-use rating has been assigned. For example, an area may be first-rate according to its soil, second-rate according to its relief features, and third-rate according to its climate. Such ratings do not indicate what is the resultant of all the factors, either in absolute terms or in terms which compare the production with other areas, or with the production of the same area with differences in the development of some of the features.

In the second approach, the whole complex of features which make up a land area is considered. Each feature is neither independent nor isolated, but interacts continually with all other features so that is modifies these other features and is, in turn, modified by them. Thus, no single feature is studied without reference to the other features, and it is the effectivity of the total complex which is evaluated.

The most stable features are used to provide units within which the development of distinctive patterns of types may be observed and described. A pattern of land-use capabilities is then established for these units.

This second (feature-complex) approach was used to classify the lands of the Glackmeyer Development Area. The landtypes which were established for this area are the basic units within which distinctive patterns of physiographic sites (each having a characteristic local climate and soil moisture supply), of biotic types, and of soil types were described.

To establish the landtypes of an area, it is necessary to consider first the development of landtypes on specific landforms. Landforms are defined on the basis of the relief of the land and the fabric of the unweathered portion of the soil profile. Landform units are universal in character since they may be used to describe areas of land which are similar in relief and fabric, irrespective of their geographic location. They are relatively stable features since changes in landform occur only over long periods of time.

On a given landform, the interaction of regional climate with the relief and soil materials of the landform results in the development of a distinctive pattern of physiographic sites. The landtype units of an area are defined in terms of this pattern. Because of the disparity in the climates of different regions, the landtypes which develop on the same landforms will vary from one region to another. Landtype units are therefore regional in character, hence a different set of landtype units must be established for each site region.

The Cochrane kame landtype (see Section II) may be used as an illustration of the pattern of sites which develops on a landform. Briefly, the origin of the landform was an overriding of a kame and esker deposit by an ice sheet which left a sag and swell till sheet over the sands and gravels. This till sheet, however varies somewhat in the texture and fabric of the geologic materials from one part of the landform to another. The range of conditions may be considered under three types of till:-

(i) impervious basal clay till,

(ii) moderately pervious, shoved-varve silty clay till,

(iii) pervious, dumped silty clay loam till.

The moderately rolling character of the underlying kame terrain is usually reflected in the surface relief, and the unequal deposition of till over the kame adds further to the brokenness of the relief. This surface relief generally permits good external drainage of air and water(See photo P8).

Hence, where the pervious materials with good internal drainage occur, forest sites of a normal ecoclimate predominate; where moderately pervious materials with moderate internal drainage occur, sites of the "transition fresh to moist" moisture regime class are the most common; where impervious materials with very poor internal drainage occur, moist sites predominate.

In this cool, moist site region, the soil process of gleization is initiated very readily be excesses of soil moisture. Thus, gleization will begin rapidly in the upper portion of the soil profile of these moist sites on impervious

materials. These sites develop relatively quickly to sites of the "transition moist to wet" moisture regime class, once gleization begins.

Within the "transition fresh to moist" sites on moderately pervious materials, temporary saturation in the upper soil layers is apt to occur, although it persists for shorter periods than in the moist sites just mentioned. Consequently, incipient gleization is frequently found within the upper soil layers and local areas of moist sites develop.

The biotic portion of a site includes the plant and animal communities of the site together with the decomposed and decomposing organic residues which constitute the relatively unstable portion of the soil mantle. Patterns of biotic types have developed and are developing on all landforms since the start of the last postglacial period. The distinctive patterns of biotic types which now exist, and the succession of these for specific areas and periods of time are best observed within the framework provided by the landtype.

The Cochrane kame landtype may again be used to illustrate the above generalizations concerning biotic site.

On fresh sites on the pervious dumped till material, a white spruce-balsam fir--aspen--balsam poplar forest occurs. The subordinate vegetation of herbs and blueberrys is associated with this cover type, and probably a particular soil fauna is also associated with this forest, though little is known of the soil fauna of this landtype at present. The litter produced by this forest is readily decomposed and it would appear that the soil fauna develops a type of humus in which the organic and mineral materials are well intermixed. Because of the good internal drainage, this combination of cover type, subordinate vegetation type, and humus type (forest type) becomes the stable climax stage. The presence of an aspen--white birch cover type with a sparse balsam fir and white spruce understory on these fresh sites is an indication of a severe modification of these sites largely by man. Cultural types of this sort are considered later in this section.

On those areas of this landtype which are characterized by impervious basal till materials having poor internal drainage, a saturation in the upper soil layers occurs. A jack pine--white spruce forest may initially become established on these areas. As gleization continues, however, this forest will be replaced by a black spruce--balsam fir forest. The subordinate vegetation (Cornus, Lonicera; Vaccinium), associated with the original cover type, will be replaced by a predominantly moss vegetation (Calliergon, Lycopodium). This second forest will in turn be replaced by a pure black spruce forest with associated Ledum shrub and Sphagnum moss vegetation. At this stage, the organic residues accumulate as partly decomposed peat.

On moderately pervious, shoved-varve silty clay till, a forest succession which is intermediate between those on the pervious and impervious materials may be found. A white spruce--balsam fir--black spruce--aspen forest with a black spruce understory and an incipient glei formation in the upper soil horizons is common on these areas. The intermediate black spruce--balsam fir forest, described above for the areas of impervious basal till, may also develop on these moderately pervious areas.

A description of the soil types of the Glackmeyer Development Area may be found in Research Supplement III. Soil types are classified on the basis of the type and extent of development of organic and inorganic horizons of the soil profile, due to the interaction of the landtype features with the biotic types which have grown on the landtype.

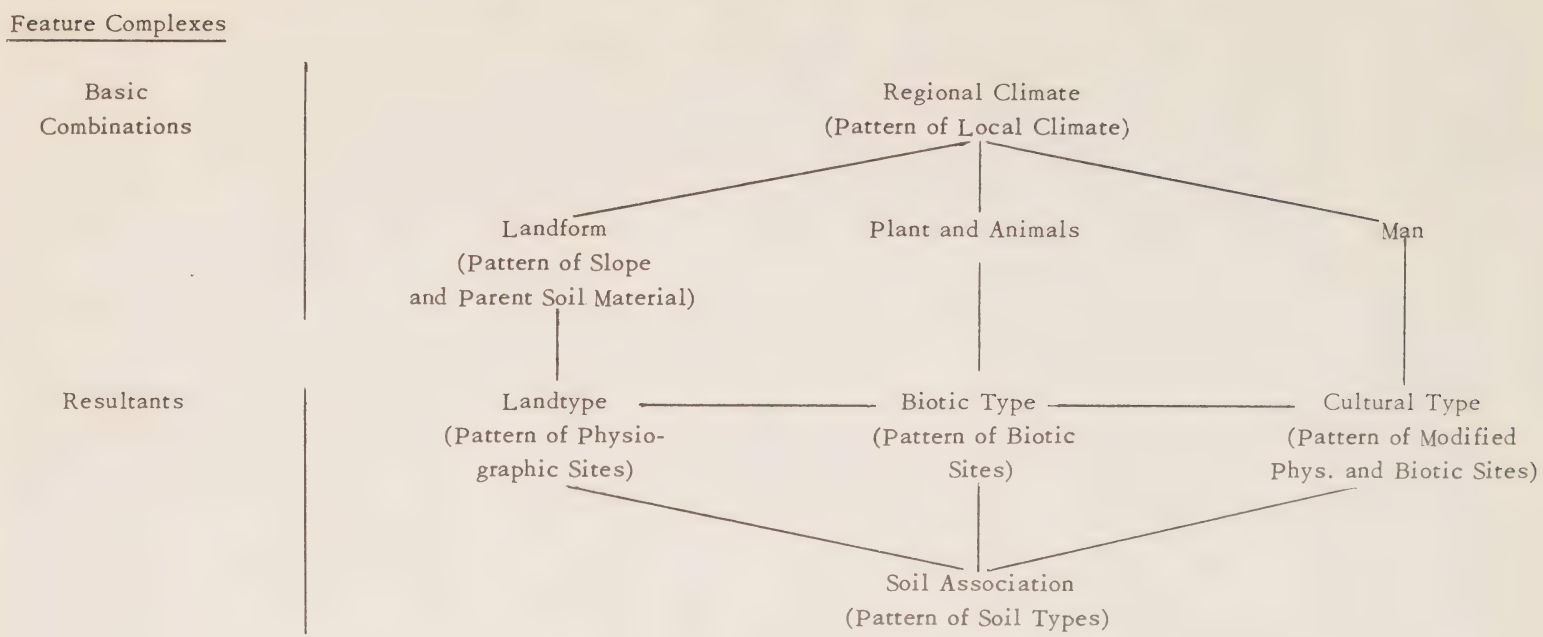
Soil type, then, is associated with the physiographic site and the forest type, and it is not profitable to consider patterns of soil types apart from the patterns of vegetation upon a landtype. The soil type changes more slowly than the biotic type and is therefore a valuable indicator of the history of biotic types. Also, soil profiles formed in a previous climatic period often survive in a modified form, in a succeeding climatic period. For example, in the Glackmeyer Development Area, a shallow soil profile developed by the recent vegetation and climate may be found superimposed upon the upper horizons of a much deeper, better developed profile, which must have been developed during the xerothermic period when pine--tolerant hardwood forests were established on these areas.

Man in his cultural activities on certain landtypes and biotic types will produce sites which have been modified from their natural condition to such an extent that they must be considered as "man-modified sites". Consequently, the concepts of the natural development of patterns of physiographic sites and the natural succession of biotic types must be broadened to include the changes to these processes which result from man's cultural activities.

To summarize the concepts dealt with in this section, the following diagram outlines their interrelationships.

Diagram 2

THE INTERRELATIONSHIPS OF LANDFORM, CLIMATE, VEGETATION AND SOIL




Note: Above interrelationships change throughout time bringing about variations in resultant types.

SECTION II

## THE AGRICULTURAL LAND-USE PLAN

### A. The Natural Qualities of the Land in the Glackmeyer Development Area

To state that approximately 85% of the 105,000 acres of the Glackmeyer Development Area is arable, merely indicates that, on this proportion of the area, the clay deposit is (i) sufficiently deep over the bedrock, (ii) sufficiently smooth in relief, and (iii) sufficiently free from stones, that the land can be plowed, providing it is cleared and drained. This does not mean that the value of the crops produced will pay for the cost of clearing and draining, particularly if the cost of clearing and draining is excessive because peat has accumulated to a considerable depth over the clay. Furthermore, arable soils vary widely in their requirements for practices to improve and maintain good tilth, and for other practices which determine the kind, yield and quality of agricultural crops. Arable lands must be further classified to indicate their relative production in relation to the cost of developing and maintaining the agricultural productivity.

An agricultural use capability rating, from Class A (best) to Class G (poorest), has been established for comparisons of the agricultural potential of land within regions. Classes A to E are arable lands subdivided on such factors as the cost of developing and maintaining good drainage, good structure and optimum nutrient levels in the soil. (See pages 166-171).

The potential of the land in the Glackmeyer Development Area is better than the average for the Cochrane Clay Belt. Approximately 25% of the 89,000 acres of arable land is well drained, 50% moderately drained, and 25% is poorly drained (10% being very poorly drained). This is in strong contrast to the average for the Clay Belt, namely, well drained occupying 10%, moderately drained 40%, and poorly drained 50% of areas of comparable size. The better than average drainage is a reflection of the geological structure (fabric) of the soil materials, there being large areas underlain by sand and gravel which facilitate internal drainage of the soil. Although good drainage is one of the requirements for agricultural use capability Classes A and B, not all of the well drained land falls into these classes. The well drained clay which caps the sand and gravel kames and eskers is often so stony, or so much broken by ravines that its rating is Class C, D or lower.

Well drained areas along stream courses may be so intermixed with eroded banks and poorly drained areas that the area as a whole has a much lower rating. Unless the areas are studied in detail, by classifying each 10 or 15 acre parcel (similar to the method employed by the subcommittee in the pilot area), the true potential of a farm lot cannot be rated. However, it has been

possible to use patterns of physiographic sites to interpret patterns of agricultural use capability classes sufficiently accurately for community planning (see Research Supplement VI). This is the basis for the present Land-Use Plan. In the implementation of the plan, a detailed farm planning program by the Department of Agriculture is essential.

B. Progress of Settlement

(1) Early Settlement

The Glackmeyer Development Area was part of a large area in the Cochrane District which was opened up in the early nineteen-hundreds. The town of Cochrane was visualized as the Winnipeg of Northern Ontario and to this end a very large area was surveyed and opened for agricultural development. A map published by the Ontario Government during this period showed an area of 3,000 square miles which was opened for settlement. This included the subdivided townships in the Glackmeyer Development Area.

The Northern Development Branch of the Department of Highways concentrated on building main roads into the area and opened up concessions "as development progressed", sometimes ahead and sometimes far behind the settlers. Effective in 1912, improvement loans and seed grain liens were made available to the settlers, being administered by the Northern Development Branch of the Highway Department.

By 1910, the area immediately surrounding Cochrane had been taken up. By 1915, small communities such as Genier, Clute and Eastford had sprung up on all sides of Cochrane. Lots available to these early settlers were 150 acres in size and for the most part were well covered with merchantable timber. The land was sold at 50¢ per acre, the settler undertaking to perform homestead duties to obtain a patent.

During the twenties, the markets for timber were good and many farm lots were stripped of their timber and abandoned. To halt this exploitation by 'timberminers', an act was passed which permitted a settler to locate on only a half lot (75 or 80 acres), and only when he had 50 acres of this under cultivation could he file an application for more land.

(2) Progress of Land Grants

The progress of settlement as indicated by the ownership of land in 1956-57 is shown on Map No. 4a. A total of 584 lots lie wholly or in part in the Glackmeyer Development Area, a number of which are broken by the Abitibi and Frederickhouse Rivers. Out of this number, all of which were open for settlement in the period 1910 to 1940, 340 or 59% have been patented, 26 or 4% are now being located, leaving 218 (or 37%) still in the Crown.

Out of the total of 105,000 acres of land which have been available for settlement, there are 25,885 acres in the present 'farm' holdings. There are 26,830 acres in located or patented lots which have been abandoned except for residence purposes. The 52,825 acres which are now in the Crown also include many lots which have been located by settlers and abandoned, leaving poor small clearings and ravished woodlots.

A discussion of the pattern of settlement during the period 1912 to 1921 is presented in Section III, pages 75-79, and on Map No. 4b.

(3) Progress of Agricultural Settlement as Indicated by Occupation of Residents on Settlement Lots

The number of families residing on the 366 patented or located lots of the Glackmeyer Development Area totalled 133 in 1956. Of these 133 families, 51 or 38% were actually deriving the whole of their livelihood by farming. Another 31 families or 24% of the total were deriving part of their livelihood from the farm. The remaining 51 families (38% of the total) were using their lot as a place of residence and in many cases as a woodlot for fuel and pulpwood.

(4) Progress in Land Clearing

The total acreage of cleared land in the Glackmeyer Development Area in 1957 is estimated to be 16,000 acres. As explained in the following section, the clearing of the land is but the first step in making it productive farm land. The building-up of soil fertility requires good farm management practices over a number of years. Accordingly, three classes of cleared land have been established, namely:-

(i) Improved Land -- Fields and improved pasture land, well cultivated and productive for at least the last 5 years.

(ii) Somewhat Improved Land -- Wild hay fields and pasture land cultivated for less than 5 years, or land formerly cultivated and cropped but not worked in the last 5 years.

(iii) Unimproved Land -- Lands which have not been brought into satisfactory production or which have not been farmed for over 20 years.

*Improved land with well-cultivated fields and pastures. Note the moist and wet inter-drumlin areas which remain in forest.*

*Unimproved, partially cleared farm land, less than 30 acres cleared. This farm has been abandoned for over 20 years, though the clearing has preserved because hay has been cut regularly by neighbours.*

The following table presents a summary of the three classes. A more detailed discussion of the fallacy of considering the mere clearing of land as an indicator of progress in settlement is presented in the next section.

Table 3

PROGRESS OF IMPROVEMENT OF SETTLEMENT LANDS

| | | Approximate Acreage |
|---|---|---|
| Cleared Land | | |
| Improved | 9,000 | |
| Somewhat Improved | 3,000 | |
| Unimproved | 4,000 | |
| Total cleared: | | 16,000 |
| Land deforested and growing brush | | 5,000 |
| Land supporting second-growth forest | | 61,000 |
| Total of 'settlement lands': | | 82,000 |

C. An Analysis of the Present Use of Settlement Lands

(1) The Establishment of Farming Effort Classes Based on Quality of Farm Practices

The best criterion with which to measure the progress of agricultural development is the number of farm units having an adequate acreage of land with a production which qualifies them as commercial farm units.

The mere clearing of land does not make productive farm land in the Cochrane Clay Belt. The surface soils of the better drained areas are low in organic matter and available nutrients until the tilth is built up by good farm practices. The imperfectly and poorly drained areas require:-

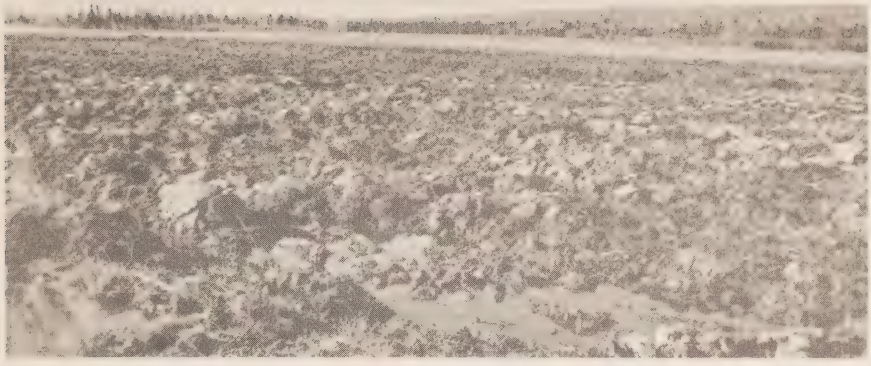
(i) Drainage,

(ii) Removal of excess peat accumulation,

(iii) Breaking-up of the hard-pan clay layers,

(iv) Incorporation of organic matter and clay to form a plow soil of good tilth.

Generally, it requires at least 15 years to get "virgin" land into shape.



*"Imperfectly drained lands (Class C, agricultural use capability) require drainage, removal of excess peat, and breaking-up of clay pan layers and incorporation of the organic matter and clay." Note the water standing on this field and the large masses of clay pan which have been turned up by the plough. The peat has been removed previously, otherwise the plowing would not have been so uniform and could only have been done in exceptionally dry seasons.*

A measurement of the progress of agricultural development has been provided through the establishment of farming effort classes. Since farm land can deteriorate rapidly in the Clay Belt, the farming effort classes assigned at any given time reflect in large part the type of farm management at that time and in the period immediately preceding, particularly the last five years. Since the rating shown on the map was made in 1956, some changes may be evident when this report is presented. Well farmed units may appear downgraded and a few units which have been subsequently neglected may appear upgraded. However, it is the objective of this study to present the overall, rather than the specific picture.

The five farming effort classes are defined on Table 4 on page 54.

In order to measure the actual progress made in agricultural development and to indicate how this progress is actually expressed, the classification outlined in Table 4 was established and applied to farms in the Glackmeyer Development Area. The improved land of each lot or half lot owned by a single individual was rated according to the classes described in the table and this rating was applied to the entire lot or half lot. A second lot belonging to the same individual was given an independent rating. This classification of improved land by lots is shown on Map No. 5.

As stated above, the farming effort on the individual lot and not on the farm unit as a whole was rated. The land owned by a single individual may thus fall into two or more classes. Some of the lots owned by a single individual are a functional part of his farm unit, others are not. For this reason, much of the analytical data is present as lots rather than farm units.

Table 4

FARMING EFFORT CLASSES

Land well farmed:

| | |
|---|---|
| I | Farm with outstanding crops, yield above average, improved pasture. Livestock in good condition with a production above average. Good and well-kept buildings. |

Land fairly well farmed:

| | |
|---|---|
| II | Farm with average crops, average yield, unimproved pasture. Livestock in fair condition with an average production. Good buildings. |

Land poorly farmed:

| | |
|---|---|
| III | Farm with below average crops, below average yield, unimproved pasture. Livestock in fair condition but with a production below average. Fair buildings. |

Land very poorly farmed:

| | |
|---|---|
| IV | Farm with below average crops, poor yield, old and unimproved pasture, brush pasture. Livestock in poor condition with a production below average. |

Land not farmed:

| | |
|---|---|
| V | r -- Resident<br>Abandoned settlement land -- Lot used mainly as place of residence. Improvements, if made, have been neglected.<br>n -- Non-Resident<br>Abandoned settlement land owned by non-resident. Improvements, if made, have been neglected. |

In the establishment of farm units in the recommended Agricultural Land-Use Plan, the present functional units were used as far as possible. There are, however, exceptional cases where the present functional units interferred too greatly with the scheme. Therefore there are differences in some of the 'farm units' mentioned in this present use study as compared with those proposed in the Agricultural Land-Use Plan (subsection E, pages 60-73).

In either case, the rating of the best developed lot, considering both acreage and degree of productivity, was applied to the unit as a whole.

(2) The Proportion of the Total Farm Holdings in Each Farming Effort Class

The following table indicates the position of the various farming effort classes in relation to (i) the total area classified as farm holdings, (ii) the total settlement area.

Table 5

TOTAL FARM HOLDINGS IN EACH FARMING EFFORT CLASS

| Farming Effort Class | Farm Holdings No. of Lots | Total Acreage | Fraction of Total Holdings | Settlement Area |
|---|---|---|---|---|
| I | 8 | 1,180 | 2% | 1.2% |
| II | 35 | 5,200 | 10% | 5.5% |
| III | 47 | 7,055 | 13% | 7.4% |
| IV | 83 | 12,450 | 24% | 13.1% |
| V | 179 | 26,830 | 51% | 28.2% |
| Total lots classified: | 352 | 52,715 | 100% | 55.4% |

(3) The Proportion of Cleared Land in Each Farming Effort Class

Although the amount of cleared land is not the final criterion of farm development, it is significant in so far that land has to be cleared before it is developed.

Table 6

CLEARED LAND IN EACH FARMING EFFORT CLASS

| Farming Effort Class | Total Holdings | | Land Cleared Acres | |
|---|---|---|---|---|
| | Acres | Av. Per Unit | Total | % of Total |
| I | 1,180 | 113 | 563 | 48 |
| II | 5,200 | 116 | 2,555 | 47 |
| III | 7,055 | 92 | 3,036 | 43 |
| IV | 12,450 | 62 | 4,179 | 34 |
| V | 26,830 | 31 | 5,100 | 19 |

(4) Improvement of Cleared Lands in Each Farming Effort Class

The classification defined on page 50 to demonstrate the degree of improvement in cleared land has been used in the following table.

Table 7

IMPROVEMENT OF CLEARED LAND IN EACH FARMING EFFORT CLASS

| Farming Effort Class | Improved | | Somewhat Improved | | Not Improved | |
|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % |
| I | 563 | 4% | - | - | - | - |
| II | 2,555 | 16% | - | - | - | - |
| III | 3,036 | 20% | - | - | - | - |
| IV | 1,300 | 8% | 2,634 | 17% | 245 | 2% |
| V | - | - | 1,499 | 10% | 3,601 | 23% |
| Total: | 7,454 | 48% | 4,133 | 27% | 3,846 | 25% |

(5) Size of present Farm Units in Each Farming Effort Class

Presently existing farm units have been classified according to the farming effort class on the lot which is considered to be the best developed from the standpoint of both acreage and intensity of cultivation. Because of this, the number of lots in farm units classified as farming effort class I is greater than the number of lots which actually meet the requirements of this classification. Other classes are likewise modified.

Table 8 furnishes evidence that the present grant of Crown lands, namely 75 acres, is woefully inadequate for a commercial type of farming.

Table 8

SIZE OF PRESENT FARM UNITS IN EACH FARMING EFFORT CLASS

| Farming Effort Class | Number of Units Size ½ Lot | 1 to 1½ Lots | 2 or more Lots | Total | No. of Lots | Av. No. Lots Per Unit |
|---|---|---|---|---|---|---|
| I | 0 | 0 | 5 | 5 | 11 | 2.2 |
| II | 0 | 11 | 11 | 22 | 44 | 2.0 |
| III | 1 | 21 | 10 | 32 | 48 | 1.5 |
| IV | 5 | 46 | 16 | 67 | 88 | 1.3 |
| V | 64 | 88 | 13 | 165 | 161 | 0.9 |
| | 70 | 166 | 55 | 291 | 352 | 1.2 |

* In this table, the farming effort rating for the farm unit is that of the highest rated lot of each unit.

(6) Time Spent on Farm in Each Farming Effort Class

From Table 9 below it is clearly evident that good farm management is a full-time occupation. Nevertheless, the fact that 37.5% of those living on farms find occupation elsewhere indicates the degree to which a part-time farming economy is established in the Clay Belt.

Very few of the non-resident farmers actually farm their land. Since the farming effort class applies to the land and not to the farmer, the class IV degree of farming is generally carried on by a neighbour who farms his own farm more thoroughly than he does the land he rents from a non-resident owner.

The number of farmers is in excess of the number of farm families since fathers and sons may live at home. In addition to the farm families, there are other families who merely reside on the land.

Table 9

TIME SPENT ON FARM IN EACH FARMING EFFORT CLASS

| Farming Effort Class | Number of Farmers | | | |
|---|---|---|---|---|
| | Full-Time | Part-Time | Not Farming | Total |
| I | 5 | 0 | 0 | 5 |
| II | 22 | 0 | 0 | 22 |
| III | 20 | 12 | 0 | 32 |
| IV | 9 | 42 | 19 | 70 |
| V | 0 | 13 | 149 | 162 |
| | 56 | 67 | 168 | 291 |

Table 10

AGRICULTURAL USE CAPABILITY RATINGS OF FARM LAND IN EACH FARMING EFFORT CLASS

| Farming Effort Class* | Total No. Lots* | Agricultural Use Capability Class | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Class A | | Class B | Classes A and B | | | |
| | | No. Lots with over 25 ac. | Av. per Lot | Av. per Lot | over 75 ac. | 62-75 ac. | 50-62 ac. | under 50 ac. |
| I | 8 | 3 | 26 ac. | 48 ac. | 3 | 2 | 1 | 2 |
| II | 35 | 11 | 26 " | 59 " | 21½ | 8½ | 4 | 1 |
| III | 47 | 5 | 9 " | 68 " | 24 | 10 | 6½ | 6½ |
| IV | 83½ | 7 | 8 " | 66 " | 34 | 20 | 16½ | 13 |
| V | 179 | 12 | 7 " | 61 " | 56 | 54 | 32 | 37 |

* Individual lots are rated in this table.

(7) Agricultural Use Capability Ratings of Farm Land in Each Farming Effort Class

Table 10 on page 58 indicates that, in general, the better farmers are farming the best land available in the Clay Belt. It is also evident that the poorer farmers are not all located on poor land, although a greater percentage of Class V farmers are located on lower grade land than are those making a greater effort.

D. Rural Economy Patterns

These are broad patterns used to describe the way-of-life of rural populations, including the kind, intensity and interrelationships of the various cropping systems within a community. Communities are patterns of individual farm units or other holdings. Examples of rural economy patterns are:-

(i) wheat farming

(ii) full-time grain and livestock farming

(iii) part time farming and forestry

(iv) full-time forestry.

Rural economy patterns are in large part controlled by the potential of the land. However, within the limits imposed by soil and climate, considerable variation in the economy can be developed through differences in the economic, social and political controls that are applied at any particular period.

"A robin does not make a spring", neither do a few well-managed farms and several productive gardens make an agricultural community. A survey of the Primary Agricultural Area, Agricultural Land-Use Plan (Map No. 6), indicates that out of a total of 323 lots, only 82½ lots comprise the 27 fully established and 21 partly established farm units. In spite of the fact that this area has a greater concentration of improved land than any area of similar size throughout the Cochrane area, it is still an area of part-time farming. When wood was available in the forest, the economy of the area was a combined forest-farm economy. If the forest had been placed on a sustained yield basis in the initial stages of settlement, the economy would have continued to be such, and would have provided better living conditions than those which exist to-day. It is anticipated, within the Primary Agricultural Area. Not until such development takes place can this area be classified as an agricultural community.

The economy of the area of secondary and tertiary agricultural development for the next 40 years will be mainly one of forestry and wildlife management. There is some probability of grazing, but it is not likely that the agri-

cultural revenue will be sufficient to justify the use of the term "farm-forest economy" unless there is some attempt to establish this type of economy. Likewise, if substantial returns from the forests are to be expected, forest management is needed to re-establish the forest on cut-over and burned-over settlement lands.

## E. The Recommended Agricultural Land-Use Plan (Detailed Description)

### (1) Classification of Farm Units

The Glackmeyer Development Area has been chosen to demonstrate a method for the initial consolidation and subsequent rational expansion of agricultural development in the Cochrane Clay Belt. In order to plan for this consolidation and expansion of agricultural development, farm units have been defined. These are classified in two ways, namely by:-

(i) The degree of present development,

(ii) The agricultural potential of the land.

To meet the requirements for general farming in the Cochrane Clay Belt, a farm unit should consist of at least 300 acres (see page 10), of which 1/3 is the best land available in the region and not more than ¼ non-arable lands.

The classification of farm units based on the degree of present development is outlined in Table 11 below. The criteria used are size of unit, improvement of land (as indicated by acreage and time spent on cultivation), and value of buildings. None of these is a criterion in in itself. A farmer may spend all his time on the farm and not improve the land. A well developed farm must have good buildings, but good buildings do not make a well developed farm.

Table 11

PRESENT FARM DEVELOPMENT CLASSES

Fully established Farm Unit
- At least 300 acres in farm unit
- At least 100 acres improved land per unit
- Presently farmed full time
- Good buildings (minimum value $2,500)

Partly Established Farm Unit
- Less than 300 acres in farm unit

At least 50 acres improved land per lot
Presently farmed full time
Minimum value of buildings $1,000

Somewhat Developed Farm Unit

At least 20 acres improved land per lot
Presently farmed part time
Minimum value of buildings $400

Not Developed Farm Unit

Not recently farmed
Land, if cleared, is unimproved and not cultivated

*A fully established farm unit with over 300 acres of land, over 100 acres of improved land, good buildings and stock. This farm unit provides full-time employment.*

*Partly established farm unit, providing full-time employment. Farm unit consists of mediocre buildings, good stock, though the herd is not of optimum size, about 50 acres of improved land.*

*A somewhat developed farm unit with poor buildings and with 30 acres of improved land (for the most part uncultivated pasture and hay crops). It is worked part-time.*

*Farm not developed. Although about 30 acres of land have been cleared, this farm has been abandoned for two decades.*

*Typical of many of the larger clearings in areas recommended for secondary and tertiary agricultural development, the land is being invaded by willow and alder shrubs, and aspen. If no use is made of these clearings until they are developed for agriculture, at least 20 years from the present, they will be almost as difficult to clear as lands which presently support second-growth timber. If grazing use is practicable for these areas, it would be a means of preserving the clearings.*

In order to direct agricultural development to lands having the best potential, a classification was established, based on patterns of agricultural use capabilities within farm units. It was originally planned that only units having 50% of their area classified as agricultural use capability classes A and B should be considered as farm units in the plan. In addition to their agricultural potential, the farm units were to be chosen in such a manner that the present ownership pattern would be retained and so that the total number of units selected would form a consolidated settlement area of sufficient size to permit the development of a satisfactory agrarian community. Consequently, an alternative plan was adopted which was based on the pairing of all lots which together would have at least 100 acres of classes A and B agricultural use capabilities, providing the acreage of poor land (classes E, F, G) was not in excess of 75 acres. In the selection of pairs, there was as little interference as possible with the present ownership pattern.

The units thus formed were divided into four choices on the relative proportion of A - and - B to C - and - D land as outlined in the following table.

Table 12

CHOICE OF FARM UNITS BASED ON
AGRICULTURAL USE CAPABILITY CLASSES

1st choice - 150 acres or over of classes A and B
At least 50 acres class A
At least 225 acres of classes A, B, C and D

2nd choice - 150 acres or over of classes A and B
Less than 50 acres class A
At least 225 acres of A, B, C and D

3rd choice - 125 - 150 acres of classes A and B
At least 225 acres of A, B, C and D

4th choice - 100 - 125 acres of classes A and B
At least 225 acres of A, B, C and D

It should be noted that the standard established for four classes is such that the entire scale, consisting of many more categories, may be established when required. This may not be for another 100 years. At this future time, the fourth choice unit will be much closer to the top of the scale than to the bottom. For the present, however, all lots which are too poor to meet the requirements of 4th choice farm units were classified as non-agricultural. Many of these are dominantly class E and F lands and will doubtless remain in forest for many rotations. Others may, in time, be classified as 5th, 6th, 7th or 8th choice farm units.

(2) The Establishment of Periods and Areas of Agricultural Development

In order to designate lands held as agricultural reserves in such a way that these may be used in the meantime for forestry, a time schedule for agricultural development is required. Three periods of consolidation and expansion have been proposed:-

(i) The Initial Period (1960-1980) -
One of consolidation of the agricultural community within an area regarded as the very best land in the Glackmeyer Development Area with regard to natural land qualities, location and present state of development.

(ii) The Second Period (1980-2000) -
One in which consolidation may be extended to suitable areas not considered in the initial period because of location and present state of development.

(iii) The Third Period (200-2060) -
One in which to complete the expansion within the total area which has been reserved for agricultural development for the next 100 years, i.e. the period of one forest rotation.

The next step was to delineate areas in which the above order of agricultural development should take place. This required an inventory of farm units organized and classified as outlined above. In the early stages of planning, it seemed an impossible task to provide a plan for 300 acre units in an area already developed on the basis of 150-acre or 75-acre grants. However, it was found that half of the developed farms already consisted of 300 acres or over. These were termed "fully established" since they met the requirements outlined above. Farms partially established, having acreages less than 300 acres, have with few exceptions a per acre production less than that of full-size units.

The objectives of the agricultural plan were to provide for the establishment of (i) approximately 100 farm units by the end of the initial period, (ii) approximately 50 more by the end of the second period, (iii) approximately 50 more during the third period. Thus a total of 200 farm units should be established in the area reserved for agricultural development during the next century.

The inventory of farm units was placed on a map (No. 6) in its initial stage. This map was then compared with the basic land feature maps. It was

evident that the boundary of the primary agricultural area (Map No. 6) should be placed to include the 26 fully established and the 21 partly established farm units. Although these units were scattered, none was more than 15 miles from Cochrane. Furthermore, a good proportion of the farm units lying between the established farms are not only partly developed but have a good agricultural potential.

The establishment of the primary area left two areas within the present settlement, in which most of the patented lots are undeveloped, but where the land has an agricultural potential only slightly lower than the primary area. The area nearest Cochrane was designated as a secondary area, it being part of a secondary area lying to the east, outside the pilot area. The area farthest from Cochrane was designated as a tertiary area. An area in which only a fringe has been opened for settlement but not developed agriculturally has been designated as a quaternary agricultural area.

The areas thus selected on the basis of their natural qualities, stage of farm development and location in respect to the town of Cochrane and other services, are defined as follows:-

(i) Area of Primary Agricultural Development -

An area within which approximately 100 farm units can be established most satisfactorily in the next 20 years (1960-1980).
(See Map No. 6, also Block A on the Multiple Land Use Map No. 11).

(ii) Area of Secondary Agricultural Development -

A land reservation to supplement the primary area through providing suitable land for settlement, particularly during the second period of consolidation and expansion (1980-2000).
(See Map No. 6, also Block B on the Multiple Land Use Map No. 11).

(iii) Area of Tertiary Agricultural Development -

A land reservation to supplement the primary and secondary areas through providing suitable land for settlement during the next 100 years. Sizeable areas now cleared and suitably located should not be reforested; otherwise area is to be managed for forest and wildlife crops. (2000-2060).
(See Map No. 6, also Block C on the Multiple Land Use Map No. 11).

(iv) Area of Quaternary Agricultural Development -

An area in which agricultural development will not take place for at least 100 years, permitting one forest rotation and probably two. It

forms part of the agricultural reserve within the farm-forestry area established by the Regional Land-Use Planning Committee.
(See Map No. 6, also Block D on the Multiple Land-Use Map No. 11).

A summary of the proposed consolidation and extension of agricultural settlement by area and stages is presented in the table below.

Table 13

SUMMARY OF DEVELOPMENT BY PERIODS AND AREA

| Area | Period 1960-1980 | 1980-2000 | 2000-2060 | Total |
|---|---|---|---|---|
| Primary | 100 | 29 | 30 | 159 units |
| Secondary | 0 | 14 | 3 | 17 " |
| Tertiary | 0 | 13 | 8 | 21 " |
| | 100 | 56 | 41 | 197 units |

Although it appears that the provision for expansion for the period 2000 to 2060 is out of proportion to the period 1960 to 2000, the following points must be noted:-

(i) The Development of 159 farm units by the year 2000 is actually the result of 90 years of settlement, not of 40 years.

(ii) Extension of settlement in the secondary and tertiary areas during the period 2000 to 2060 has been curtailed in the Glackmeyer Development Area, having regard to other areas with similar agricultural potential but better located along main highways, or closer to centres of population (for example, areas along Highway No. 11, near Cochrane, but not in the study area).

The number of farm units required for each period may require adjustment when all the settlement areas in the Clay Belt are evaluated. For example, agricultural farms in the Glackmeyer Area in 1980 should be 50 or 100 in order that this area be assured of its share of the Clay Belt markets. However, if the entire Clay Belt Region is examined in the light of the Glackmeyer data, a final decision can be reached as to periods and areas for development in each area in the Clay Belt.

The plan has provided for 100 farm units rather than for 50 units since there are now already 26 fully established units and 21 partly established

units. It is true that the first objective, from a strictly agricultural point of view, should be devoted to the development of these 47 units to their greatest capacity. This, however, is considered to be but a phase of the initial period of the plan. The development of a broader area for primary agricultural development requires consideration in this initial period.

In spite of the fact that modifications of the proposed schedule may be required, it was necessary to make a first approximation in order to present the problem realistically.

(3) The Proportion of Present Farm Development Classes in Each of the Agricultural Areas

The following table indicates the relative degree of present agricultural development in primary, secondary and tertiary agricultural areas.

Table 14

PRESENT FARM DEVELOPMENT CLASSES IN EACH AGRICULTURAL AREA

| Agricultural Area | Class of Farm Unit: Fully Established | Partly Established | Somewhat Developed | Not Developed | Total |
|---|---|---|---|---|---|
| Primary | 26 | 21 | 50 | 62 | 159 |
| Secondary | - | - | 1 | 16 | 17 |
| Tertiary | - | - | 1 | 20 | 21 |
| Total units: | 26 | 21 | 52 | 98 | 197 |

(4) Area of Primary Agricultural Development

In order to present clearly the detailed farm units, the blocks presented on the Multiple Land-Use Map (No. 11) are not drawn on Map No. 6 but the key to this latter map indicates the relationships between the areas of agricultural reserves on this map and the blocks of Map No. 11. For example, the area of primary agriculture on Map No. 6 includes not only Block A (the primary agricultural area proper) but also other blocks or parts of blocks which are designated for forestry or other land uses. In the following discussion, however, the more restricted agricultural area (Block A) is dealt with.

As mentioned in the previous section, this area was established to include all the fully and partly established farm units. Lands having a high agricultural potential dominate Block A. Within this block are a few scattered

areas, ranging from one to several lots in size, which will not be needed for agriculture in the next 100 years. (Coloured light green on Map No. 6). These have been considered in the forestry plan as interim forest units, if a number of such lots occur contiguously, and Crown forests where the lots are isolated.

The following table outlines for Block A interrelationships between the degree of present development of the farm units and the agricultural potential of these units, described as 1st, 2nd, etc. choice classes.

Table 15

PRESENT FARM DEVELOPMENT CLASSES IN EACH AGRICULTURAL POTENTIAL (CHOICE) CLASS

BLOCK "A"

| Choice Class | Number of Units in Each Present Farm Development Class | | | | |
|---|---|---|---|---|---|
| | Fully Established | Partly Established | Somewhat Developed | Not Developed | Total |
| 1st | 11 | 5 | 5 | 6 | 27 |
| 2nd | 9 | 9 | 27 | 25 | 70 |
| 3rd | 3 | 3 | 4 | 15 | 25 |
| 4th | 3 | 4 | 14 | 16 | 37 |
| All choices (Farm units) | 26 | 21 | 50 | 62 | 159 |
| Other-use lots | | | | | 35 |

In Block A there are a total of 159 farm units (of 2 or more lots) and in addition 35 lots with a potential below that of 4th choice and not presently needed for agriculture.

The method of establishing the farm units has been outlined on page 73. Although the most suitable lot available was selected for each unit, the best arrangement could not be made in many cases because of present ownership patterns reflecting the original granting of single lots. Whether or not the future ownership pattern will meet the objectives proposed, will depend, in large part, upon the initiative of the farmers in overcoming the restrictions imposed by lack of initial planning of settlement in the area. In some cases, a farmer may decide to be satisfied with 150 acres of land rather than to ob-

tain a good piece of land some distance from the home farm. Therefore, the combinations of units have been proposed, not with the intention that every detail should be implemented, but as suggestions for future consideration and as a basis for evaluating potential farm production on a uniform basis in the present plan.

Of the 112 relatively undeveloped units, there are 63 units with good agricultural potential (1st and 2nd choice). The plan provides for only 53 of these to be developed before 1980 in order to bring the total of established farm units to 100.

As mentioned above, it is questionable if such rapid progress can be made. Certainly, it is optimistic in view of past experience. However, sufficient scope for agricultural development should be provided in this area, even though the time period may require extension.

During the second period of consolidation and expansion it is proposed that the remaining 10 second-choice and 19 third-choice units be developed. Whether this period may be extended 20 years or not, is of minor consequence. It is certain that these lands will be needed before a crop of forest can be grown on the presently cleared fields. On the other hand, fourth-choice units with less than 15 acres of cultivated lands should be considered as forest lands for the present. This, of course, will depend upon the owner, if the land is patented. However, farmers on the poorer lands will be encouraged to take up better land where they will receive government assistance.

(5) Area of Secondary Agricultural Development

This is an area which, though close to Cochrane and of fairly good agricultural potential, has not yet been developed. It has been separated from the primary area largely because of the location at the end of side roads which are not well maintained.

In order to present clearly the detailed farm units, the blocks presented on the Multiple Land-Use Map (No. 11) are not drawn on Map No. 6 but the key to this latter map indicates the relationships between the areas of agricultural reserves on this map and the blocks of Map No. 11. For example, the area of secondary agriculture on Map No. 6 includes not only Block B (the secondary agricultural area proper) but also other blocks or parts of blocks which are designated for forestry or other land uses. In the following discussion, however, the more restricted agricultural reserve area (Block B) is dealt with.

The following table relates present farm development to agricultural potential (choice classes) for the units in Block B.

Table 16

PRESENT FARM DEVELOPMENT CLASSES IN EACH AGRICULTURAL POTENTIAL (CHOICE) CLASS

BLOCK "B"

| Choice Class | Number of Units in Each Present Farm Development Class: Fully Established | Partly Established | Somewhat Developed | Not Developed | Total |
|---|---|---|---|---|---|
| 1st | 0 | 0 | 0 | 2 | 2 |
| 2nd | 0 | 0 | 1 | 4 | 5 |
| 3rd | 0 | 0 | 0 | 7 | 7 |
| 4th | 0 | 0 | 0 | 3 | 3 |
| All choices (Farm units) | 0 | 0 | 1 | 16 | 17 |
| Other-use lots | | | | | 1 |

No immediate development should take place in this area unless a satisfactory plan is submitted by which services can be provided to 1st and 2nd choice lots in this block more economically that 1st and 2nd choice lots in Block A. It has been pointed out that it is unlikely that all the 1st and 2nd choice lots in Block A will be developed by 1980.

In the second period of expansion, however, it is anticipated that all 1st, 2nd and 3rd choice lots in Block B will be developed.

It is recommended that roads and drainage projects should not be undertaken until the need for land in this block (B) is clearly demonstrated.

The postponement of agricultural development in this area presents the problem of what should be done with the present clearings. Grazing has been suggested. However, it is not definitely known if grazing is feasible and until a decision has been made, by agricultural authorities, clearings of more than 30 acres in size on farm units should not be reforested, particularly those which may be developed for agriculture before the end of the first forest rotation. Some form of wildlife management may be the best interim land use.

Seven clearings, in Block B, totalling approximately 740 acres, are so located that three groups of clearings may be considered. These groups are

indicated on the Forest Land-Use Plan (Map No. 9).

(6) Area of Tertiary Agricultural Development

This is an area which has been opened for settlement since 1910. At one time or another, there has been a settler on every lot. Most of the land is now abandoned, although the houses may be still occupied by woodcutters or pensioners. The closest boundary of this area is 16 miles from Cochrane.

In order to present clearly the detailed farm units, the blocks presented on the Multiple Land-Use Map (No. 11) are not drawn on Map No. 6 but the key to this latter map indicates the relationships between the areas of agricultural reserves on this map and the blocks of Map No. 11. For example, the area of tertiary agriculture on Map No. 6 includes not only Block C (the tertiary agricultural area proper) but also other blocks or parts of blocks which are designated for forestry or other land uses. In the following discussion, however, the more restricted agricultural reserve area (Block C) is dealt with.

The following table relates present farm development to agricultural potential (choice classes) for the units in Block C.

Table 17

PRESENT FARM DEVELOPMENT CLASSES IN EACH AGRICULTURAL POTENTIAL (CHOICE) CLASS

BLOCK "C"

| Choice Class | Number of Units in Each Present Farm Development Class | | | | Total |
|---|---|---|---|---|---|
| | Fully Established | Partly Established | Somewhat Developed | Not Developed | |
| 1st | 0 | 0 | 0 | 0 | 0 |
| 2nd | 0 | 0 | 1 | 12 | 13 |
| 3rd | 0 | 0 | 0 | 6 | 6 |
| 4th | 0 | 0 | 0 | 2 | 2 |
| All Choices (Farm units) | 0 | 0 | 1 | 20 | 21 |

Other-use lots 13

It is recommended that no agricultural development should take place during the next 20 years. However, at the end of that period it is possible

that provision for the development of the 13 second-choice units may be made.

Before the year 2060, the end of the first forest rotation, it is anticipated that in addition to the 13 units mentioned above, the remaining 8 lots will have been likewise developed.

As in the secondary areas, the problem arises of how the present clearings should be used during the waiting period. There are 18 clearings in Block C, totalling approximately 1,000 acres. Of these, 15 are so located that 4 groupings of clearings can be made conveniently. These 4 groups are indicated on the Forest Land-Use Plan (Map No. 9). Since grazing has been suggested as an interim use of these clearings, reforestation of clearings should not be made until a decision regarding their use has been made by authorities in agricultural or other land use.

(See Research Supplement pages 159-173 for principles and methods used in planning agricultural land-use).

SECTION III

## THE FOREST LAND-USE PLAN

### A. The Natural Qualities of the Forest Lands of the Glackmeyer Development Area

Approximately 90% of the land of the Glackmeyer Development Area is capable of supporting at least 5 cords of pulpwood per acre and 25% is potentially able to produce over 30 cords. (1) Forest use capability ratings, from Class A (best) to Class F (poorest), have been established to allow comparisons of the potential productive capacity of the lands of the Site Region. (2) Classes A to E contain the range of operable forests, and classes F and G the range of inoperable forests and non-forest lands (e.g. bogs). Because of variations in the kind and degree of natural disturbance to forest sites, and because of variations in cropping practices, the productivity of the forest types which are established on any given site may be appreciably less than the potential productivity of the site. Hence, allowing for these variations, an estimate can be made of the probable production of any site at maturity.

Modifications to the site caused by natural disturbances, cultural practices and forest types, are grouped into site condition classes which range from the best observed condition of a site to the very poorest condition observed. (See page 200).

For a given combination of forest use capability class, site condition class and forest type, a subjective estimate is made of its actual productivity at maturity. Actual productivity is expressed as a proportion of potential productivity. (See page 202).

Finally, for each unit a degree of effort class is established to indicate the amount of effort which would be required to obtain a forest type with a relatively high productivity for a specific site. To assess degree of effort, the salient features to be considered are the brush competition potential of the physiographic site class and the density of stocking and species composition of the present forest type. (See page 203).

The forest types of the Glackmeyer Development Area are shown on Map No. 7 (Present Forest Cover) and described in Research Supplement V. Map No. 8 shows the sites of the Development Area grouped on the basis of their forest use capability ratings and described in terms of site condition, proportionate production, and degree of effort classes.

Footnotes (1) per 100 years (2) See pages 193-200

## B. The History of Forest Exploitation

### (1) Settlers' Cutting

#### (a) The Period 1910 to 1914

Settlement of the Glackmeyer Development Area began about 1910. The General Returns of the Crown timber agent, as summarized in Table 18, show that by 1914 at least 68 settlers had taken up lots. These lots were grouped to form a nucleus of 6 distinct communities (see Map 4b). The two largest of these groups (38 lots) were located one on each side of Lillabelle Lake. These two blocks of settlement were fairly well consolidated. The remaining four groups of more widely dispersed lots centred around Cochrane (7 lots), Genier (11 lots), Larocque (5 lots), and Lot 8, Con. VI, Glackmeyer Township (5 lots).

General Returns for the season 1913-14 indicate that settlers at that time had resided on their lots 2½ years on the average, and the maximum period of residence was 4 years. Also at this time, settlers' clearings averaged 10 acres, the largest clearing being 25 acres.

Settlers' cutting during the period 1912-14, and presumably from 1910-14, was almost exclusively sawlog timber. The lots were well located for saw-timber production, because roughly 90% of the land is of forest use capability classes A to C and these are the classes which produce timber of sawlog size. Most settlers cut about 28,000 F.B.M. per season, the equivalent of approximately 100 cords. Three or four settlers, however, cut about 200,000 F.B.M. or the equivalent of approximately 700 cords per season. (For a summary of the cut see Table 19).

#### (b) The Period 1914 to 1917

During this period, at least 56 settlers took up lots so that a total of at least 124 settlers were located in the Development Area by the end of the period. These lots were grouped roughly into 6 groups (see Table 18). The two former groups around Lillabelle Lake and the Cochrane group coalesced to form one large group of 76 lots. This group was fairly well consolidated since gaps between the occupied lots totalled only 20 lots (20% of total). The second group, centring around Genier, totalled 21 lots. This group was not well consolidated, the gaps between occupied lots totalling 11 lots (35% of total). The small group centring around Lot 8, Con. VI, Glackmeyer, remained almost unchanged (one further lot was taken up during this second period), and in addition a small group to the southeast (5 lots) was formed. This latter group centred around Lot 2, Con. II, Glackmeyer. Three lots were added to the Larocque group and it became part of the Lillabelle-Cochrane-Genier complex. Finally, 5 widely scattered lots were located in Clute Township, where one

SUMMARY OF SETTLEMENT IN THE GLACKMEYER DEVELOPMENT AREA
FOR THE PERIOD 1912 TO 1921

| Period of Settlement | Group Number | Centre of Group | No. of Located Lots | Gaps between Located Lots No. of Unlocated Lots | % of Total |
|---|---|---|---|---|---|
| First | 1 | E. Lillabelle | 14 | 3 | 18 |
| (1912-14) | 2 | W. Lillabelle | 24 | 12 | 33 |
| " | 3 | Cochrane | 7 | 4 | 26 |
| " | 4 | Genier | 11 | 5 | 31 |
| " | 5 | Larocque | 6 | 1 | 14 |
| " | 6 | Lot 8, Con. VI, Glack. | 5 | 3 | 47 |
| Second | 1-2-3 | Lillabelle-Cochrane | 76 | 22 | 22 |
| (1914-17) | 4 | Genier | 21 | 11 | 34 |
| " | 5 | Larocque | 8 | 0 | 0 |
| " | 6 | Lot 8, Con. VI, Glack. | 6 | 2 | 25 |
| " | 7 | Lot 2, " II, " | 5 | 0 | 0 |
| " | 8 | Blount & Clute Twps. | 8 | Very Scattered | |
| Third | 1-2-3 | Lillabelle-Cochrane | 92 | 20 | 18 |
| (1917-21) | 4 | Genier | 32 | 12 | 27 |
| " | 5 | Larocque | 11 | 0 | 0 |
| " | 6-7 | Lot 8, Con.VI & Lot 2, " II, Glack. | 31 | 17 | 35 |
| | 8 | S. Clute | 38 | 8 | 18 |
| | 9 | W. Clute-Leitch-Blount | 15 | 8 | 35 |

lot had been located during the first period, and 2 lots were located in Blount Township.

There was a definite shift to pulpwood production during the 1914-15 operating season, but pulpwood production fell off sharply in the following two seasons of this period. Pulpwood production from the Development Area from 1915 onwards varied considerably from year to year and the average production per settler in any year was not high (for example, 175 cords per settler were cut each year during the 1914-15 and 1920-21 operating seasons). From the General Returns for the Cochrane District it would appear that the demand for pulpwood from the Development Area was not large because pulpwood could be obtained from sources closer to the pulp mills of the district which were located at Iroquois Falls, Smooth Rock Falls and Kapuskasing. (For a summary of settlers' cutting see Table 19).

(c) The Period 1917 to 1921

By the end of this period, there were approximately 220 settlers in the Development Area (see Table 18). The Larocque group had coalesced with the Cochrane-Lillabelle group and with a group in the south part of Clute Township, but these groups have been considered as separate groups to indicate the trends of development from the second to the third period. Sixteen lots were added to the Lillabelle-Cochrane group, but they did not consolidate the area greatly since many of these lots were located on the fringe area. The Genier group was enlarged by 11 lots, but this group also was not appreciably consolidated by these additions. The greatest settlement activities in this period occurred in the south part of Clute Township where 34 lots were located. The two groups in the south-east part of Glackmeyer Township coalesed to form a single, poorly consolidated group. A comparison of maps 4a and 4b indicates that approximately 65% of the lots were are now patented were either patented or located in 1921. A comparison of maps 4b and 5 indicates that the settlement area in 1921 was approximately the same as the present farm area. There were, however, more lots located in 1921 than there are lots being farmed in the area today.

The cutting during this third period (see Table 19) was largely for pulpwood, the volume varying considerable from year to year.

(d) Summary of Settlers' Cutting

Table 19, which follows, summarizes the cutting by settlers for the period 1912 to 1925. Records from 1925 to the present are not readily available and are thus not included in this summary. It is believed that the cut in this final period averaged about 2,000 cords per annum for the period 1925 to 1930, and after that time only very small quantities of wood were produced from the farm settlement lots of the Development Area.

Table 19

SUMMARY OF SETTLERS' CUTTING ON THE GLACKMEYER DEVELOPMENT AREA FOR THE PERIOD 1912 TO 1925

| Settlement Period | Operating Season | Number of Settlers Cutting | Sawlogs (FBM Doyle) | Pulpwood (Cords) | Ties (Pieces) | Total Production* (Cords and equival. cords) |
|---|---|---|---|---|---|---|
| 1 | 1912-13 | 42 | 1,742,600 | 63 | | 5,326 |
| " | 1913-14 | 38 | 1,556,298 | 394 | | 5,794 |
| 2 | 1914-15 | 80 | 945,179 | 5,218 | 216 | 8,662 |
| " | 1915-16 | 35 | 784,848 | 837 | 3,216 | 3,360 |
| " | 1916-17 | 12 | 404,932 | 424 | | 1,918 |
| 3 | 1917-18 | 60 | 124,940 | 6,118 | | 6,520 |
| " | 1918-19 | 8 | 30,000 | 666 | | 767 |
| " | 1919-20 | 40 | 423,880 | 2,327 | | 3,760 |
| " | 1920-21 | 93 | 758,290 | 11,129 | | 13,692 |
| 4 | 1921-22 | | 410,500 | 969 | | 2,356 |
| " | 1922-23 | | 143,200 | 1,655 | | 2,139 |
| " | 1923-24 | | 46,000 | 5,341 | | 5,496 |
| " | 1924-25 | | 109,500 | 4,613 | | 4,983 |
| " | 1925-26 | | 95,400 | 2,582 | 2,455 | 2,949 |

* The volumes of sawlogs and ties were converted to cords to obtain a common basis for total production estimates.

(2) Cutting on Licensed Areas

The first timber license on the Development Area was issued in 1928. The licenses issued during the period 1928 to 1936 were for relatively small areas. In 1937, 1949 and 1950, larger licensed areas were acquired, and small licenses were issued in three other years of the period 1936 to 1950. Approximately 15,000 acres of the Development Area are still under license, 3,600 acres of licensed land have been abandoned since 1928. Table 20 below summarizes the area of timber licenses.

Table 20

SUMMARY OF THE TIMBER LICENSES OF THE GLACKMEYER DEVELOPMENT AREA

| Year | Number of Licenses Issued | Area Covered by Licenses |
|---|---|---|
| 1928 | 1 | 150 ac. |
| 1933 | 2 | 300 |
| 1935 | 2 | 950 |
| 1936 | 1 | 150 |
| 1937 | 2 | 3,200 |
| 1938 | 1 | 300 |
| 1940 | 1 | 150 |
| 1948 | 1 | 300 |
| 1949 | 2 | 3,200 |
| 1950 | 2 | 9,900 |
| | | 18,600 ac. |

During the period 1928 to 1957 there were approximately 163,000 cords cut from the licensed areas. The proportions of species and products of this total production were the following:-

| | |
|---|---|
| Spruce Sawlogs | 10 % |
| Spruce Pulpwood | 86 % |
| Balsam Fir Pulpwood | 2 % |
| Birch Fuelwood | 1 % |
| Balsam Fir, Birch and Poplar Sawlogs, and Balsam Fir and Poplar Pulpwood | 1 % |

C. Rural Economy Patterns

(1) The Farm and Forest Economy Pattern

Block A, the Primary Agricultural Area, has been developed for agricul-

ture to a greater extent than the other blocks of the Glackmeyer Development Area. Yet even within Block A there is not a sufficiently large area of uniformly well developed agricultural land to permit its segregation from the rest of the block as an area characterized by a dominantly farming economy. Thus Block A, as a whole, must be considered as an area presently characterized by a farm-forest economy.

A summary of the area of lands in various stages of agricultural development indicates that 20% of the lands of Block A are farmed to the extent that the farm managers derive almost all their income from farming. This 20% of Block A comprises the fully established farm units. An additional 7% of Block A lands are farmed to the extent that the farm managers derive most of their income from farming (the partially established farms). Hence something less than 27% of Block A is farmed sufficiently to provide an adequate income for its managers. Somewhat developed farms account for about 15% of the lands of Block A. On these farms the owners derive their income from farming and from other sources, principally from the forest. The farm lots which are not developed for agriculture, where the owners reside on the lots, account for 10% of the lands of Block A. The owners of these lots derive all their income from sources other than farming, mostly from the forest. The remaining 48% of the lands of Block A are not developed for agriculture and include Crown lots and patented lots with absentees owners. In the latter case, the owners for the most part are not dependent upon the economy of the Development Area, nor to a large extent are they dependent upon the economy of the Clay Belt.

(2) The Farm-Forest Economy Pattern

At the present time, no portion of the Development Area is characterized by a true farm-forest economy. Although Block A is not a full-time agricultural economy, the returns from forestry are poor because of lack of conveniently located forests. In the farm-forest economy which formerly obtained in Blocks A, B and C at the time when settlement reached a maximum, the revenue was chiefly from the forest. At the present, however, approximately 45% of the lands of Blocks B and C are Crown lands and another 45% are lands of non-resident owners. Less than 1% of the lands of Blocks B and C are developed for agriculture to the extent that their owners derive part of their income from farming. Thus, at the present time, a forest economy pattern is the only one which characterizes Blocks B and C. Although these blocks are reserved for future agricultural development, this forest economy must continue for some time and should be directed if possible.

(3) The Forest Economy Pattern

Blocks B, C and D are characterized by a forest economy pattern.

The forests of Blocks B and C were harvested by settlers who cut on

their own lots and obtained cutting permits for Crown timber. These forests contribute little to the economy of the Development Area at the present time because the mature timber has been cut and the second-growth forests have not as yet reached merchantable sizes.

The forests of Block D were for the most part harvested by timber operators who held cutting rights to the timber of the block. The timber license system was an efficient means of liquidating the mature timber of the block, but it is poorly adapted to a scheme of forest management. The timber operators cannot economically undertake a forest management scheme, and although the forests can be managed by the Crown who would offer timber for sale from time to time, this system would have the disadvantages that there is no continuity to forest operations and that the management phase is isolated from the harvesting phase. To circumvent these disadvantages, the Forest Land-Use Plan outlined in Section III D proposes that the forests of Block D be organized into small forest holdings which will ultimately be managed by farm-forest workers. In the initial stages the Department of Lands and Forests will be responsible for the management of these forest holdings. However, as the farm-forest workers, who are continually associated with the management program, acquire the basic skills of forest management, they will assume an increasingly larger share of the management work. There are at present about 25 residents of the Development Area who have lots which are not developed for agriculture. Many of this group would undoubtedly associate themselves with the management scheme as farm-forest workers.

In the initial stages of the rehabilitation of these areas, the residents will derive their livelihood almost exclusively from the forest. In the latter stages, as the workers in the forest develop their skill in producing forest crops and as agricultural development takes place on the better lands, a farm-forest economy will become established.

## D. Recommended Forest Land-Use Plan

### (1) The Objectives of Forest Management

#### (a) The Broad Objectives of the Forest Land-Use Plan and Forest Management Plans

Intensive forest management has not been practiced on the forest lands of the Glackmeyer Development Area, thus only a part of the productive capacity of these lands has been realized. A diversified and well balanced farm-forest economy is essential for the wise use of the natural resources of the Development Area (see the Rural Economy Pattern sections of the Agricultural and Forest Land-Use Plans). To strengthen this economy, an intensive forest management scheme must be practiced. The objective of this management scheme, therefore, would be to attain a sustained production of forest crops at a level which approaches the potential productivity of the lands which are

brought under management.

The Forest Land-Use Plan has been designed to provide a framework for the forest management plans for the Development Area. The management plans to be prepared by the Department of Lands and Forests will supplement the land-use plan by providing in detail the techniques and methods to be used to attain the objectives of the management scheme which is proposed in the land-use plan. The Forest Land-Use Plan has organized the forest lands into Crown forest properties. The drafting of management plans and the direction of forestry work will be the responsibility of the Department of Lands and Forests; the management practices will be executed by farm-forest workers. As the latter develop the skills of management, on the more permanent forest properties, they will assume a larger responsibility for the forest management phases.

The forest properties are divided into seven classes on the basis of (i) the relative length of time each class of property can be devoted to the production of forest crops, (ii) the productivity and size of the forest properties, (iii) the function of the forest properties. The classes of forest properties are the following:-

(i) Permanent Forestry Units
(ii) Interim Forestry Units
(iii) Full-term Crown Forest Lots
(iv) Half-term Crown Forest Lots
(v) Quarter-term Crown Forest Lots
(vi) Protective Forestry Areas
(vii) Wet Land Areas

(b) The Establishment of Forestry Units

The consolidation of agricultural development and the delineation of the agricultural communities have an important bearing upon the Forest Land-Use Plan. When no estimate is made of the probable expansion of agricultural development and when no direction is given to consolidate this expansion, the forest use of broad areas must be relegated to lands of the lowest agricultural and forestry use capabilities. However, after an Agricultural Plan has been drafted, forest use may be planned for lands of all use capabilities on the relatively accessible areas just beyond the existing and proposed agricultural establishments.

Areas varying from approximately 600 to 1,200 acres have been selected throughout the Development Area for forestry units. The majority of these units are located in the northern portion of the Development Area (Block D), an area which will not be developed for agriculture for at least one forest rotation. The remainder of the units are located within the blocks reserved for

more immediate agricultural development. Forestry units in the primary, secondary and tertiary agricultural blocks are located on lands which have the lowest priority for agricultural development owing to their low agricultural use capability ratings and hence will not be developed for agriculture for at least one forest rotation. The forestry units have been so chosen that the potential productivity of each exceeds 20,000 cords and so that the potential productivities of all units are approximately equal. Forestry units which are dominantly composed of lands of high forest use capabilities are smaller and more compact than units which are dominantly composed of lands of lower forest use capabilities. Many of the advantages of these smaller units are offset by the relatively greater degree of effort which is required to attain a high proportion of their potential productivity.

Forest management must be practiced on the forestry units for the greater part of one forest rotation to attain, for the next rotation, a sustained production at a level which approaches the potential productivity of the land. After one rotation, the forestry units will provide a source of livelihood for farm-forest workers which is comparable to that of the fully established farm managers of the Development Area. During the first rotation, the farm-forest workers would derive their income from forest management work on the forestry units and from cutting timber on Crown lands of the farm-forest settlement area.

(2) The Classes of Forest Properties of the Glackmeyer Development Area

(a) Permanent Forestry Units

Absolute forest lands are rarely found because, with a few exceptions, even marginally productive forest lands can be developed for agriculture when economic conditions are such that the returns from agricultural production will offset the high costs involved in developing these lands. The exceptions are extremely stony, rocky or eroded lands. The occurrence of these types of land in the Glackmeyer Development Area is negligible. Permanent forestry units are lands where agricultural development will be deferred for a sufficient period to permit the growing of at least two forest crops. An intensive level of forest management is practicable when these lands can be devoted to forest production for this length of time. After the unit has been managed for one forest rotation period, a permanent forestry unit can be counted on to provide farm-forest workers with a steady income.

(b) Interim Forestry Units

Interim forestry units are areas of relatively high agricultural use capabilities which are located within or adjacent to existing or proposed agricultural communities. Because of their agricultural potential and their location, these units will logically be the first to be developed for agriculture. How-

ever, this agricultural development will not be initiated for at least 100 years, thus the interim forestry units may be managed for at least one forest rotation.

The main objective of the forest management of interim units will be to attain a high level of production from the units during the first forest rotation. Less emphasis will be given to organizing the unit for subsequent sustained production than will be given to this aspect of the management of permanent forestry units.

Regional multiple land-use planning will have an important bearing upon the length of time that the lands of forestry units, particularly interim forestry units, will be devoted to forest production. Regional planning will aim at establishing and preserving the diversified farm-forest economy of established communities by keeping a satisfactory proportion of each area in forest. This will be accomplished at the time when primary and reserve agricultural areas have been fully developed by opening up new development areas rather than developing the agricultural potential of the forest lands of the established development areas.

(c) Full-Term Crown Forest Lots

Three and one-half widely separated lots located in the primary agricultural area have been designated as full-term Crown forests. Although full-term Crown forests are in the same category as interim forestry units, insofar as the period they may be devoted to forest production is concerned, there is not a sufficient area of these forests that they may be grouped to form an interim forestry unit. Because these forests occur as widely separated lots, each lot must be managed as a separated forest property.

(d) Half-Term Crown Forest Lots

These Crown forest lots are located in the primary and reserve agricultural areas. They will not be developed for agriculture for at least 40 years and because the forests are, for the most part, 40 years old at present, it is possible that they will be harvested by farm-forest workers. Half-term Crown forests occur as scattered lots, thus, although they may be counted on to produce a crop of timber for the farm-forest workers, they cannot conveniently be consolidated into forestry units.

The half-term forest lots form parts of potential farm units. The lots with which they are associated, if they are patented, are not presently developed for agriculture.

Crown lands united with somewhat developed farm lots or partially established farm lots have not been considered as half-term forest lands because it is assumed that they may be developed for agriculture before the year 2000. They have been designated as quarter-term Crown forest lots.

(e) Quarter-Term Crown Forest Lots

These Crown forests are also located in the primary and reserve agricultural areas. They will not be developed for agriculture for at least 20 years. These forests will, for the most part, be harvested by settlers because they will be acquired by the settlers when the forests are approximately 60 years old. The lots with which these Crown lots are united to form potential farm units are not presently developed for agriculture.

(f) Protective Forestry Areas

The primary purpose of protective forests is to prevent river and stream banks from eroding and to maintain suitable habitat conditions for wildlife. A selection cutting plan will be devised for these areas. The cutting areas and the volume of timber cut at any time from these forests will not be sufficient to permit the establishment of forestry units on these areas.

(g) Wet Land Areas

The typical wet lands (open muskegs and stag spruce swamps) produce marginal forests. These should not be cut since cutting generally favours an increase growth of moss and of soil moisture. Included areas of transition moist to wet land may be cut from time to time. However, the forest production of these areas, on the whole, does not justify the cost of forest management.

(3) A Summary of the Forest Land-Use Plan

The following table presents a summary of forest properties in the Glackmeyer Development Area. These areas are discussed in detail in the following section.

Table 21

SUMMARY OF THE FOREST LAND-USE PLAN

| Multiple Use Block* | Permanent Forestry Units | | Interim Forestry Units | | Crown Forests | | | Protective Forests | Wet Lands | | Large Clearings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Acreage | No. | Acreage | Full-Term | Half-Term | Quarter-Term | Acreage | No. | Acreage | No. | Acreage |
| | | | | | Acreage | | | | | | | |
| D | 16 | 18,490 | 3 | 2,420 | | | | | 2 | 1,200 | | |
| C | | | 1 | 1,650 | | 1,160 | 900 | | | | 4 | 910 |
| B | | | | | | 1,250 | 2,650 | | | | 3 | 740 |
| A | 1 | 1,870 | 1 | 1,140 | 400 | 1,490 | | | 1 | 1,600 | | |
| E, F & G | | | | | | | | 9,000 | 1 | 1,260 | | |
| | 17 | 20,360 | 5 | 5,210 | 400 | 3,900 | 3,550 | 9,000 | 4 | 4,060 | 7 | 1,650 |

* For location of Multiple Use Blocks see Map No. 11 (Recommended Multiple Land Use Plan).

(4) Plan for Block D (Primary Forestry Area; Quaternary Agricultural Area)

Block D (see Map No. 9) is part of the agricultural reserve in the broad farm-forestry plan for the Cochrane Clay Belt. Since it is doubtful if this land will be needed for agriculture for at least two forest rotations, it has been designated as quaternary agricultural land. Because of its accessibility and forestry potential it is rated as a primary forestry area being of great value in a farm-forestry settlement economy.

Most of the lands of Block D are Crown lands. Approximately 1/5 of the lots in the area have been located at one time or another. All of these have been cancelled except 4½ which are patented and 4 which are still located.

(a) ~~Interm~~ Interim Forestry Units

Areas with fair to good potential for agriculture adjacent to the tertiary agricultural area have been divided into three interim forestry units. There are the areas which have been part of the settlement area but are not sufficiently developed to be included in the tertiary area. Having been cut over in a haphazard manner for the last thirty years, there are areas which have stands of various ages and accordingly are more valuable than the recent cut-overs of the licensed areas. However, planting will be required on most of these interim forestry units.

(b) Permanent Forestry Units

The remainder of the block, belonging mainly to the Crown, has been divided into sixteen permanent forestry units. Thus this area can eventually support at least sixteen forest workers. Forest management work may be undertaken without delay on the units which are located outside the licensed area. As the licenses are abandoned, forestry work can be started on the remaining units.

(c) Wet Land Areas

There are two wet land areas in Block D. These areas are not sufficiently productive to be included with the forestry units. Cutting should be restricted to the included moist areas, but no attempt will be made to fully develop the potential productivity of the area as a whole because the costs involved would greatly exceed the returns.

(d) Preliminary Road Plan

A preliminary road plan of a system of all-weather, main access roads for Block D, is shown on Map No. 9. In drafting this road plan, consideration was given to the following factors:-

(i) The possibility of a straight projection of the existing roads which border or partly traverse the block.

(ii) The need to provide access to all forestry units within the block.

(iii) To locate roads on the well-drained sites where road building costs are minimal, in so far as this is consistent with (i) and (ii) above.

The whole system involves 22 miles of road. There are 3 miles of road of a suitable standard already in use, consequently 19 miles must be built to complete the system. The portion of the system outside the licensed areas (see Map No. 4b) might be undertaken without delay and the rest of the system started when the licensed areas are abandoned.

(5) Plan for Block C (Tertiary Agricultural Area)

Three types of forest properties are planned for Block C:-

(i) An interim forestry unit of 1,950 acres (24% of the area of Block C).

(ii) Half-term interim Crown forests totalling 1,160 acres (14% of the area of Block C).

(iii) Quarter-term interim Crown forests totalling 900 acres (11% of the area of Block C).

The remaining 4,290 acres of Block C are located or patented lands which are for the most part not presently developed for agriculture.

(a) Interim Forestry Unit No. 20

This forestry unit is composed of 34% lands of Class C forest use capability, 7% Class D, 53% Class E and 6% Class G lands. Because it is likely that, for many years, only lands of Class C and better forest use capabilities will be developed for general farming (small areas of Class D lands may be developed for pasture), there are approximately 650 acres of this forestry unit which may be developed for agriculture after the first to fourth choice farm units of the Development Area have been developed. The Agricultural Land-Use Plan indicates that it will be 100 years before all the better farm units will be required for agricultural development, hence the Class C lands of this forestry unit will not be developed for at least 100 years. Because the Class C lands are generally broken by Class D and E lands, it is probable

that only one farm unit will be developed eventually in the forestry unit. This farm unit would be located in the south-west corner of the forestry unit. The remaining Class C lands would probably be annexed to the adjacent farm units of Blocks A and C.

There are 124 acres of clearings on Class C lands and 35 acres of clearings on the lands which may be developed for agriculture after 100 years (Class C) are small. They occur as 10 scattered fields and thus no recommendation is made for retaining them. Since these clearings will not be maintained in a suitable condition until they are required for agriculture (at least one forest rotation), they should be planted with forest trees. The 35 acres of clearings on Class E lands (3 fields) should unquestionably be planted since these lands will not be developed for agriculture for a period considerably in excess of 100 years.

There are 2 half lots which are located and 5 lots which are patented in this forestry unit. The individuals who have located lots should be given an opportunity to settle on a holding in Block A, because their present holdings are marginal for agricultural development at this time. The patented lands of this unit should be acquired by the Crown. It is not likely that any of the owners of these patented lots would be interested in acquiring a farm holding elsewhere in the Development Area because none of them reside on their lots.

(b) Half-Term Crown Forests

These areas are third and fourth choice potential farm units of Block C which will be developed for agriculture during the period 2000 to 2060. The dominantly aspen forests at the back of these potential farm units will be approximately 80 years old at the beginning of the development period. These forests of the farm units which have not been taken up within the first 20 years of the development period should be cut to avoid serious decay and and mortality losses. These forests will thus provide an additional wood supply to the farm-forest workers of the Development Area. The forests of farm units which because of their location or their low agricultural use capability are not likely to be developed for agriculture before 2020 will be harvested by the farm-forest workers of the area and thus may be managed at the same level of intensity as the interim forest units.

The cleared land of this area may be combined with the cleared land of quarter-term Crown forests since they are in the same category insofar as forestry planning into 7 composite clearings which vary in area from 200 to 350 acres, revert to scrub and hardwood and present a clearing problem later which will be almost as formidable as the clearing of second-growth forest lands. The practicability of using these areas for grazing or wildlife management should be ascertained. In any case, these clearings should not be planted since they are likely to be developed for agriculture long before the plantations reach maturity.

(c) Quarter-Term Interim Crown Forests

These areas may be developed for agriculture during the period 1980 to 2000. The forests of the potential farm units are largely aspen woods. They might be improved by underplanting of white spruce in locations where this could be done at a low cost. Such planting would increase the value of these woodlots, so that they would be a real asset to the settlers who eventually will acquire them. The forests will be only approximately 80 years old at the end of the development period, hence it is likely that they will be harvested by settlers.

As the potential farm units of Block C become developed, a program of extension forestry will be required in order that the farmers may be advised concerning the management of their woodlots.

(6) Plan for Block B (Secondary Agricultural Area)

Block B has been subdivided into three areas in the Forest Land-Use Plan:-

(i) Half-term Crown forest land, approximately 1,250 acres, 24% of the area of Block B.

(ii) Quarter-term Crown forest land, approximately 2,650 acres, 50% of the area of Block B.

(iii) Patented lots, approximately 1,400 acres, about 26% of the area of Block B, only one lot of which is at present developed for agriculture.

(a) Half-Term Crown Forest Lands

These lands form a compact block in the southwest corner of Block B. If agricultural development of Block A proceeds at the rate predicted in the Agricultural Land-Use Plan, these areas will be developed for agriculture during the period 2000 to 2060. The forests will be about 80 years of age at the beginning of this period and thus would not be harvested before this time. If the development of Block A should proceed more slowly than anticipated, this half-term forest land can be organized as an interim forestry unit. In any case, management of these lands will be at the same level as that practiced on interim forestry units.

The clearings of this half-term forest land are small and scattered, and thus need not be maintained.

(b) Quarter-Term Crown Forest Lands

These lands will not be managed at an intensive level of management. Similar to the quarter-term forests of Block C, open aspen stands on upland sites will be underplanted with white spruce where this can be done at low cost, and brush in openings may be killed with chemical spray to encourage natural seeding of conifers. These measures are designed to increase the value of the forests to the settlers who will later acquire them

As the potential farm units of Block B are developed for agriculture, a program of extension forestry will be required in order that the settlers may be advised concerning the management of their woodlots.

(7) Plan for Block A (Primary Agricultural Area)

Block A has been sub-divided into six classes of areas in the Forest Land use plan. These classes are the following:-

(i) Permanent forestry unit No. 21, 1,850 acres, 3% of Block A

(ii) Interim forestry unit No. 22, 1,050 acres, 2% of Block A

(iii) Full-term Crown forest land, 400 acres, 1% of Block A

(iv) Half-term Crown forest land, 1,490 acres, 3% of Block A

(v) Wet land area, 1,100 acres, 2% of Block A

(vi) Located and patented lots (in all stages of agricultural development, 48,110 acres, 89% of Block A

(a) Permanent Forestry Unit No. 21

The western portion of this unit is a pattern of lands of F and C forest use capabilities. The C lands are so badly broken by F lands that their potential for agricultural development is very low. In the eastern portion of this unit, there is an irregular area of land of Class C forest use capability. Although this area is 400 acres in size, it is a long, narrow strip of land being confined between the Dora Lake reserve to the north and wet lands to the east and south. Because of its irregular shape, this land could not readily be developed for agriculture. In view of the above, this forestry unit has been considered a permanent forestry unit.

Approximately 1½ lots of this unit are located lands. The individuals

located on these lots should be given an opportunity to acquire a more desirable farm unit in Block C.

In the western portion of the unit there are 6 small clearings totalling 60 acres. The clearings should be planted since they will not be developed for agriculture for at least one forest rotation.

(b) Interim Forestry Unit No. 22

This unit is dominantly land of Class D forest use capability. As noted previously, Class D forest use capability lands have a low agricultural use potential.

The cleared lands of this unit are all located on Class A and C lands. These clearings should not be planted, they should be maintained by grazing or other means until they are developed for agriculture.

There are 3 patented lots and one half lot located in this unit. These lots should be acquired by the Crown. The individual on the located lot should be given the opportunity to settle on one of the more desirable farm units of Block C, or be granted his present home site as a small holding.

(c) Full-Term Crown Forest Land

There are 540 acres of Crown forest on scattered lots which are rated below the agricultural use capability rating of fourth choice agricultural land. These lands will not be developed for agriculture for at least one forest rotation. Although these lots are too scattered to form an interim unit, each lot will, however, be managed separately at the same level of intensity as will be used for interim forests.

(d) Half-Term Crown Forest Land

There are approximately 1,490 acres of Crown forests on scattered lots which form parts of fourth choice agricultural units. These lands will not be developed for approximately 40 years and the forests on these lots will be approximately 80 years old at this time. Hence these forests will, for the most part, be harvested by the settlers who acquire them. These Crown forest lands will be managed at the same level of intensity as the half-term forests of Blocks B and C.

(e) Wet Land Area

There is an area of wet lands in Block C to the east of Forestry Unit No. 22. The forests of local moist areas of this wet land will be cut from time to time, but no effort will be expended in the management of the area as a

whole. Very wet areas should not be cut. The lands of Class C forest use capability bordering the F lands of this area will eventually be annexed to adjacent farm units.

(f) Located and Patented Lots

An increased program of extension forestry will be needed to assist the farmers with the management of their woodlots. The details of this program must be worked out later from a study of the land-use plans and the farm management plans of the individual farm units.

(8) Plan for Blocks E, F and G (Protective Forests)

For the purposes of the Forest Land-Use Plan, these three blocks may be considered as a unit. The primary purpose of the forests of these blocks is to prevent erosion of river and stream banks. To provide the maximum protection these forests must be cut lightly, several times during a roation using short cutting cycles. Because the volume of wood available from these blocks at any time will be small, on a per acre basis, and be spread over a large area, and because the cutting must be very carefully planned, these blocks should be managed by the Crown. The Department of Lands and Forests should plan the cutting, mark the timber to be cut, and offer it for sale by tender in a manner similar to that used currently for local timber permit sales.

There is one wet land area in Block F which borders Brower Creek and is located west and north of Block D. This area is dominantly land of F forest use capability, broken by small areas of Class C lands. The Class C lands are too small in size and too scattered to have a potential for agricultural use and the pattern of F and C lands is not sufficiently productive from a forestry standpoint to permit the establishment of a forestry unit. The natural forests of the moist areas will be cut from time to time, but no efforts will be expended on the management of the whole area. Cutting of the forests which border Brower Creek will be limited to selection cuttings, so that the stream banks would be protected from erosion and so that the conditions of the stream which influence its value as a wildlife habitat would not be impaired.

(See Research Supplement Pages 174 to 205 for the principles and methods used in planning the forest use of land).

## THE WILDLIFE LAND-USE PLAN

In this plan, the term wildlife includes all animals, including mammals, birds and fish, found in their natural, free (undomesticated) state. Wildlife land use generally cannot be considered in terms of the wildlife present on the land prior to use of the land for man's purposes, but must be considered in terms of the changes in environment effected by man. This is particularly true where agriculture is the major land use and becomes less and less as the major use moves through forest use to major wildlife use. One must, then, consider what the major use provides or can provide in terms of habitat, competition and desire, and attempt to develop wildlife use on this basis. In some special cases, where a unique or nearly extinct species is involved, the original land condition must be retained in order to maintain the particular species, e.g. Aurora trout waters will no doubt be retained in their original condition for some time to come, the species being exceptionally rare and of great potential value.

It is obvious, then, that little detailed planning of wildlife use is possible prior to the establishment of the major uses on the area. However, it is possible to outline a number of important considerations and principles which must be applied as the multiple-use plan of any area is being developed.

### A. The Value of Wildlife

It is impractical to attempt to assess the value of wildlife resources in terms of dollars and cents. Many attempts have been made to do this, but they show only that the resource is valuable. One cannot compare wildlife use of land to other uses objectively because there does not appear to be a common ground for comparison.

How an adequate appraisal of wildlife-use values can be achieved is not known. It is possible, however, to reach a point where the general public demands that wildlife use receive high priority over other uses. Unfortunately, when this stage is reached, the situation is usually difficult to remedy, and it is in order to avoid such situations that planning is necessary. Consideration of wildlife-use values must include not only the monetary values apparent in revenues and commercial use, (commercial fishing, tourist industry and trapping), but also the human values associated with recreation. There is an increasing need for this type of recreation as the tempo of living in modern society increases. Recreational wildlife use takes many forms, from hunting and fishing through photography and bird-watching to just walking in the forest listening to wild sounds.

It is possible to go to great length to explain and enlarge the aesthetic values of wildlife use, but that would not achieve the desired result. The

potential values and difficulties in evaluating them comparatively have been outlined. It will remain necessary for some time to come to have men of sound unbiased judgement decide the issues where controversy arised over land-use priorities. There is no doubt that wildlife use has an increasing value and the trend towards this increase is likely to continue.

B. The Use of Wildlife

One of the problems in managing a wildlife resource which is becoming more and more critical in many areas, is that of adequately harvesting the crop. This may sound fantastic to many in the light of records of past exploitation and extermination, but nevertheless, the problem has become severe in many fields of wildlife management. The reasons are usually twofold; the first is related to vast areas of private land where public use is not permitted, and the second is related to public sentiment, e.g. hunters refusal to shoot female deer.

Wildlife resources are much the same as other renewable resources in that they cannot be hoarded or stored up. They often bring about their own destruction through continued over-population. In order to control wildlife populations and realize their full value, it is essential that public use be possible. The wildlife resources of this country have been specifically retained in the Crown in order to assure equal right of use to all persons. Therefore, any plan for multiple use of lands must be so organized that it is possible for all persons to make use of wildlife if they so desire.

The farming economy of to-day is dependant to a large extent on private ownership of the land, and use of such lands for wildlife is dependant on the good-will of the landowner. On other lands, (exepting small holdings), public use can readily be permitted (although closely controlled if necessary) in as much as other land uses such as forestry are not dependant on private ownership of the land. In the light of the tremendous increase in the numbers of persons desiring and requiring to make use of wildlife, (deer licence sales in Ontario have increased from 15,000 in 1936 to 85,000 in 1956), there is no doubt that space in which to hunt will eventually become a critical factor. (Michigan averaged over 450,000 deer hunters per year during 1953, 1954 and 1955). Realistic multiple-use planning must recognize this problem and provide for adequate hunting and fishing space. Reservation of land in the Crown is presently one of the best methods to achieve this.

A brief reference to the pattern of disposal of Crown lands in the Glackmeyer area readily demonstrates how lack of planning results in loss of space to hunt and fish. On Brower Creek, for example, 18 lots or 75% of the lots through which this stream flows, are now patented, restricting public use to the remaining 25%. Clute Creek shows the same trend, with 15 of the possible 19 lots patented. This is an area that has been settled only in com-

paratively recent years. Should Brower Creek prove to be a good speckled trout stream (and there is evidence of this possibility), its development and use will certainly be hindered by the land ownership.

## C. The Role of Water in Resource Management

Land use is controlled to a large extent by water. The degree to which water is present or absent is a major factor in determining the capability of the land. Where use of water is permitted to affect the water itself, it can have a very great effect on all subsequent users, of both land and water.

Industries using water may contaminate it to the extent that subsequent use is impractical. This contamination may vary from extreme and obvious pollution by such things as cheese or canning factory wastes, to the less obvious and more subtle effects of cattle watering causing turbidity and siltation, or the deposition of sawdust and bark from river drives reducing fertility.

All persons must be assured equal right to clean water. Multiple land use then must require persons using water to return it to the water course in an improved, if not its original state. Control of water must remain in the Crown.

Where unwise forestry or agricultural practices occur, the effects on water (both free water and ground water) may be disastrous. Stripping of forest cover from stream banks and entire water-sheds can lead to complete alterations of water conditions, which in many cases are disastrous, not only to the wildlife but to agriculture and forestry, and even to the land itself. It is necessary then that Crown-controlled protective forests be established on all watercourses in order to assure proper maintenance of natural watercourses. Where particular problems of drainage are encountered, planned alteration of the water-course can be carried out without serious difficulty. Provision must be made of course for adequately controlled access to water for farm livestock.

## D. The Scope of Planning for Wildlife Land Use

Planning for wildlife use must take many factors into account. Quality and quantity of wildlife as well as demand all have a very great bearing on wildlife use. Planning on district, regional and provincial levels is required to assure that provision is made to supply the quality and quantity of non-commercial wildlife crops required. Shortage of certain types of wildlife which may result from lack of pre-planning can have a large bearing on tourist development. On one hand, the result can be a reduction in tourist trade (species is abundant elsewhere) and on the other hand, the result can be an increase in tourist trade (species scarce and much sought after). Also, lack of advance land-use planning may result in extreme pressures to change from one species to another. Such changes, if extensive, can result in almost total

elimination of species, and such has been the case to a considerable extent in Southern Ontario, where many good speckled trout waters have been heavily developed with cottages. Cottagers generally desire mid-summer fishing which speckled trout do not provide, consequently there is a demand to introduce other species into the water. Once this stage is reached, little can be done to retain the trout water.

Pre-planning, to provide a minimum of public trout fishing, appears to involve the restriction of cottage development on the waters required and suitable for speckled trout.

E. The Integration of Wildlife Land Use into the Multiple Land-Use Plan

The multiple use of land, of necessity, must permit and require compatible land uses. Minor alterations in the major use of land may greatly increase the prospects of additional types of use. The affects of wildlife on agriculture and forestry must be considered in wildlife-use planning, as they may in some instances be highly undesirable. Examples of this type of problem are common. Browsing by big game animals frequently interferes with normal forest regeneration and where over-abundant, the result can be highly undesirable. Small game, too, may create problems as demonstrated by the effects of jack-rabbits on orchard crops. The wildlife which a specific land-use area produces, must also be evaluated in the light of its effect on adjacent areas. Wolves, living in the forests surrounding the little clay belt, apparently have a depressing effect on the sheep raising industry on that clay belt. Elk are undesirable in the forests adjacent to farming areas because they can transmit the sheep liver fluke.

Wildlife use then must be modified to suit the major land uses of any area except perhaps where it is itself the major land use. For this reason in most areas its development will depend entirely on the development of the other uses. In some cases, the objective will be to increase the population of one species, and at the same time reduce the population of another. There will, of course, be cases where particular individuals of any species must be removed because of undesirable traits.

Probably the most effective means of controlling populations is that of controlling habitat. Where production is high (suitable environment) hunting and trapping can provide the desired control and at the same time provide much recreation. Wherever possible, control should be carried out by manipulation of the harvest (hunting, fishing, trapping) and this should be done by the hunting and fishing public.

F. The Detailed Description of Areas Shown on Wildlife Land-Use Plan (Map No. 10)

Apart from the urban and recreational areas, where concentrations of human populations do not permit the optimum development of wildlife land use, all the blocks of the Glackmeyer Development Area have been rated as areas of primary wildlife land use. This rating is based on the premise that, since all the blocks (with the exception of the wet lands) have a high proportion of the most biologically productive lands in the region, each area is capable of producing a specific type of wildlife equal to that produced by any area in the region. The specific type of wildlife land use will vary from block to block, depending upon the major land uses of the block, but each will merit a primary rating within a regional classification. The accessibility of the entire area for the purposes of harvesting the wildlife crop is also an important factor in rating these areas as primary wildlife areas.

Although wet lands are biologically less productive, these areas are included in the primary areas; since being of relatively small extent, they may be considered part of the primary production area. At the present extensive level of wildlife land use these areas are differentiated from one another on type rather than on quantity of production. Large areas of wet lands, however, could not be rated as areas of primary wildlife land use.

(1) Protective Forests and Water Access Areas

As has been pointed out, surface and ground water are of major concern to all types of land use, and in order to assure minimum disturbance of natural water courses, Protective Forests have been recommended. The primary function of these forests is protection of stream and river banks, reduction of erosion, retention of water (where this is desired), and public access to the water courses. These forests can be primary wildlife-use areas with little interference with their intended purpose of protection.

The type of Crown wildlife management that can be carried on in these protective forests will be determined largely by the primary land use on adjacent areas, in as much as the wildlife thus produced must be compatable with the land use on these adjacent areas.

It is realized also that any part of this protective forest may be set aside for primary recreational use in the future.

(2) Wet Land Areas

These areas, as has been outlined in the Forest Land-Use Plan, are of limited use. They can, however, provide considerable habitat for some types of big game (particularly moose), provided they are associated with other suit-

able types of range. Whether or not the small isolated stands of timber should be harvested or left for wildlife use will depend upon their value as part of the over-all wildlife habitat. These isolated stands possibly will mean the difference between some wildlife use and no wildlife use of the wet lands.

Consideration must be given these areas then from a wildlife-use point of view with a strong possibility of wildlife becoming the major or primary use. This, of course, depends upon many factors (species, associated use areas, etc.) and will be a problem for the local manager to solve.

*Although the wet lands of the clay belt are areas of low biological activity, they have a limited potential for wildfowl and fish production. This potential is probably not attained by nature's management, hence wet land could likely be more fully developed by wildlife management.*

(3) Forestry Units

Forestry units, established primarily to produce forest crops, will contribute significantly to the wildlife use of the area and will undoubtedly be the major public hunting grounds. Crown control of both wildlife and forestry use should permit close integration to provide the best multiple use. Where control of certain animal populations is required (e.g. depredations of snowshoe hare in forestry plantations), first consideration should be given to affecting this control through public use (hunting, drives, etc.). Maximum public use of wildlife crops available from these areas is essential.

(4) Crown Forests Associated with Undeveloped Agricultural Land

Wildlife use of these areas will be determined largely by existing local conditions. Several important factors should be considered in the use of these areas.

(i) Much of the undeveloped land in the study area is patented, and although abandoned, cannot be managed by the Crown under existing legislation and policy. However, proper management of adjacent Crown forests could quite possibly increase wildlife use over not only the Crown forest areas, but the adjacent undeveloped agricultural land.

(ii) Wildlife is a relatively short term crop, in relation to timber, and indeed is often a product of only one stage of growth of the forest. On areas where time will not permit one forest rotation, it is quite possible to harvest considerable crops of wildlife, depending, of course, on the type of wildlife use desired.

(iii) Wildlife land use on these Crown forests can have little adverse effect on adjoining lands, and hence a less restricted type of use is envisaged.

(5) Crown Forest Associated with Developed Agricultural Land

These areas of Crown forest, generally small and scattered throughout the agricultural area, will require wildlife use which is compatable and supplementary to the wildlife use of the agricultural lands. For certain types of use they may well form the nuclei for management schemes designed to increase wildlife use of farm lands.

(6) Primary Agricultural Land

Most of this land is patented, and the type of management required to produce maximum wildlife use will of necessity be extension rather than Crown management. This applies to the majority of wildlife management on agricultural land, with two major possible exceptions, namely, control of nuisance species, and introduction of desirable species.

The type of wildlife use possible on these farm lands will be determined almost completely by the type of agriculture being practiced.

(7) Water Areas

Wildlife use of the water areas will be dependent largely upon the planning done over large areas (e.g. the Cochrane Clay Belt). It is necessary that

a complete analysis of types, quality and potential of waters be carried out and development of wildlife use must be based on this analysis.

Crown control of all water use is necessary, and this control must be sufficiently close to assure good water is available to everyone.

G. Conclusion

In conclusion, it should be stressed that in all the study area, of greatest importance is the provision for adequate means (access) of using the wildlife.

SECTION V

# THE RECREATIONAL LAND-USE PLAN

## A. The Objective of the Recreational Land-Use Plan

"Recreation is the creative use of leisure time. Leisure, in the life of any individual, is that segment of time which is separate and apart from the time spent as necessary to meet the material needs of himself and his family.

"Recreation connotes all that is recreative in the individual, the community and the nation. In this sense it is broader than the "physical activity" concept. It includes mental and spiritual expression. Recreation should allow for gratification of the nearly infinite variety of tastes and predilections so far as that gratification is consistent with the best sustained use of the nation's resources."*

The Recreational Land-Use Plan (see Map No. 10) does not attempt to present in detail all of the many phases of recreational land use which are included in the broad concept outlined above. Only brief mention will be made of the aesthetic use of land. That phase of recreation which is derived from the wildlife use of land has been more fully discussed in the Wildlife Land-Use Plan (of the preceding section). The Recreational Land-Use Plan deals mainly with the "physical activity phases" which are provided for by provincial and local parks, summer resorts and picnicking areas.

## B. The Provincial Parks Program

The need for recreational facilities has developed during this century as one of the first principles of a "full life". The 40-hour week and a higher standard of living have promoted the desire in the average citizen to own a cottage or to spend his vacation sightseeing across the country by means of car and trailer or tent.

It must be assumed that the responsibility for the provision of recreational facilities rests with the province. Since alienation of land from the Crown results, in most cases, in a sharp curtailment of any further public use of that land, the province must provide for public recreation and include it in any multiple land-use plan under consideration.

* Paraphrased from "Recreational Use of Land", Part XI of the Report on Land Planning, U.S. National Resources Planning Board, Washington, 1938.

To meet the need for increased recreational facilities, the Division of Parks was formed within the Department of Lands and Forests. Since the inception of this new division in 1954, eighty-two provincial parks are now in operation or under development. These parks are all relatively large areas of at least 500 acres. Thus, before planning the recreational use of land within the confines of the Glackmeyer Development Area, mention should be made of the Provincial Parks Program within the Cochrane Clay Belt.

Camping and picnicking facilities in these parks will, to a large extent, meet the needs of the Glackmeyer community. The nearest park, Greenwater, comprising 11,000 acres and 25 miles from Cochrane, will provide up to 200 camping units and picnicking facilities for 200 to 300 people. This development will go forward, dependent upon provincial and district needs. Another provincial park, Kettle Lakes, is 50 miles from Cochrane and comprises 2,472 acres. Development in Kettle Lakes Park is better advanced and this year (1958) should provide facilities for 200 campers and 200 picnic parties. An additional reserve of 40,000 acres in the Little Abitibi Lake area will provide further recreational facilities ~~where~~ when needed.

C. The Recreational Use Capability of the Land in the Glackmeyer Development Area

Recreational areas providing for the maximum expression of "physical activity" are limited in the Glackmeyer Development Area. Clay Belt land does not lend itself too readily for recreational development of this type. A limited amount of hunting and fishing, as forms of recreation, have been provided for in the wildlife portion of the plan. For summer resorts, the public seems to favour a sand-forest-water type of terrain. The study area has many combinations of forest and water but lacks the complement of sand.

Therefore, within the study area any reservations for ~~purpose~~ recreational will be of a minor nature (in comparison with the development anticipated for a provincial park) and will serve the public for picnic areas, cottage development and in the recreational sense of hunting and fishing.

*Although the clay belt does not lend itself too well to the coventional recreational activities, a limited number of summer resort areas (both established and potential) are available on lakes of the clay-capped kame landtype as illustrated here, and more particularly on the esker-outwash-kettle lake sand plains which occur in various parts of the clay belt.*

D. The Detailed Description of Areas Shown on the Recreational Land-Use Plan

Three types of areas have been designated as primary recreational land-use areas, namely:-

(i) Cottage site development areas,

(ii) Parkettes and other local use areas,

(iii) Water areas.

In the first two of these, wildlife land use cannot be established on a primary level because of the concentration of human populations on these areas. On most of the water areas, however, wildlife land use is essential to their development for recreation. Hence these areas are placed under wildlife on the map and are discussed more fully in the text of the Wildlife Land-Use Plan.

Recreational land use is secondary on the remaining blocks designated as primary wildlife land-use areas. In the following discussion these are grouped according to whether agriculture or forestry is the major land use.

(1) Cottage Site Development Areas

The land surrounding Silver Queen and Eastford Lakes has been recommended for cottage site development. A considerable portion of the eastern banks of Silver Queen Lake has already been developed. Within the exception of the parkette areas, as shown on the map, the remainder of the shorelines on the two lakes should be held as recreational reserves.

(2) Parkettes and Other Local Use Areas

These are areas which are to be permanently reserved and developed for public use. Most of the selected areas are parkettes located on rivers or lakes. A specific use of public areas, such as these, is to provide access to navigable portions of the rivers.

A part of the local use areas immediately north of Cochrane could provide a suitable supplement in the Cochrane Town Parks. The remainder should be preserved for a wildlife sanctuary with nature trails.

(3) Water Areas

As mentioned above, these are areas in which both wildlife and recreational land uses are primary. They have been listed initially under the Wildlife Land-Use Plan since wildlife is essential for recreation on many of these areas.

Several of the lakes in the Glackmeyer Development Area are suitable for speed boating, and portions of the Abitibi and Frederickhouse Rivers are suitable for motor boats and canoes, since rapids occur only at intervals. The water areas also provide recreation through hunting and fishing.

(4) Forests and Wet Lands

Most forests (both protective and production forests) now provide for minor recreational land uses such as hunting. Many of the protective forest areas will in time have a major recreational land use such as cottage site development.

(5) Fully and Partially Developed Agricultural Land

A pattern of fields and forests is a favourable environment for many upland game species. Consequently, hunting is an important recreational use of these areas.

Landscaped homesteads and fence rows, a feature which enhances the recreational use of many farm communities, is developed to a very small de-

gree in the Glackmeyer Development Area. The development of a northern type of farm landscape would not only provide a fuller life for the residents of the community, but would enhance the attraction of tourists to the Northern Clay Belt.

SECTION VI

# THE RECOMMENDED MULTIPLE LAND-USE PLAN

## A. The Nature and Objective of the Multiple Land-Use Plan*

An evaluation of the capabilities of the land of the Glackmeyer Development Area in the light of present and prospective land uses indicates that a combination of land uses, rather than a single land use, is most desirable for this area. Although there are local areas which are recommended for primary agricultural development, agriculture will be the major but not the only land use. In most of these blocks, forestry will continue to assume a prominent role (co-major or sub-major). Furthermore, these agricultural blocks occupy a relatively small proportion of the total settlement area. Consequently, for many years to come, the proportions of their total revenue which the rural residents of the Clay Belt will receive from farm crops will not be much greater, if as great, as that received from forestry. Thus the settlement area as a whole will continue to be characterized by a farm-forestry or other type of combination economy.

The objective of a Multiple Land-Use Plan for the settlement areas of the Clay Belt is to establish areas (called blocks) which are differentiated on the proportion of farm to forestry development which is recommended for that specific area. Since the objective of this report is to determine the extent and rate of agricultural development, areas with moderate to high agricultural potential are first rated in terms of agricultural development, while areas of low agricultural potential or areas more urgently required for other uses are rated according to major uses other than agriculture.

In order to ensure a satisfactory balance in resource use, recommendations have been made to reserve areas for wildlife and recreational land uses. In addition, both of these uses have been superimposed upon agricultural and forestry uses in the remaining areas.

Thus the Multiple Land-Use Plan is an integrated summary of the Agricultural, Forest, Wildlife and Recreational Land-Use Plans presented in the preceding sections.

## B. The Integration and Rating of Land Uses Within and Between Blocks

The basic consideration in the present study was to establish reserves for agricultural development in order that forest management may be initiated

* See Research Supplement VI, page 206, for definitions and discussion of principles and methods.

on lands with the very best forest potential as close as possible to transportation and labour sources. Four blocks have been established according to their relative value within a scheme for progressive agricultural development in the Cochrane Clay Belt. All of these occur within the area designated as the Clay Belt Settlement Area and correspond to the proposed four periods of agricultural development (see page 65), namely:-

(i) Block A
Primary Agricultural Development, 1960-1980
(one-quarter forest rotation)

(ii) Block B
Secondary Agricultural Development, 1980-2000
(one-half forest rotation)

(iii) Block C
Tertiary Agricultural Development, 2000-2060
(one forest rotation)

(iv) Block D
Quaternary Agricultural Development, later than 2060
(more than one forest rotation)

If the immediate use of these blocks for forestry could be assured, all of them could be classified as primary forestry areas because of their proximity to roads, railroads and labour sources. However, the first three cannot be so classified at the present time since it is proposed that a large proportion of them will be developed before a forest crop can be grown and harvested.

The quaternary agricultural area has been classified as a primary forestry area, since it is probable that it will produce at least one and probably two or more forest crops before it is needed for agriculture. Although a portion of the area is not as well suited for agriculture as Blocks A, B or C, the forest potential for the most of the block is fair to excellent (see Map No. 8) and it is favourably located for a restorative and sustained type of forest management.

Lands in Blocks B and C which are of good forestry potential and are not required for agriculture for at least one forest rotation, constitute secondary forest areas. The extent of such areas is dependent upon the need for these lands for agriculture. Furthermore, if a decision is made to defer agricultural development in the entire blocks, all of the land would become primary forest land.

In Block A, only sizeable areas of fair to good forestry land but of low agricultural potential should be considered as primary forestry land. The present state of forests in Block A suggests a tertiary type of forest land

generally, but under good woodlot management this area could support a secondary type of forest use in addition to a primary type of agricultural use.

Primary wildlife land use is recommended for all of these blocks. Wildlife, however, cannot be considered a major use for any of those blocks with a high percentage of developed agricultural land until an upland game species can be found for the north comparable to the pheasant of the south.

Table 22 presents the proposed changes in the importance of the various land uses within the various blocks during specific periods of development.

C. The Detailed Description of Blocks Shown on the Multiple Land-Use Plan

The key to the plan (Map No.11) presents a summary of land uses recommended for each block during each period of development. Since this plan is an integration of the specific land-use plans presented in the preceding section in considerable detail, only the integrating aspects of land use will be dealt with in this section.

(1) Recommended Agricultural Areas

These are areas dominated by lands having a moderate to high potential (on a regional scale) for the production of either agricultural or forest crops. Their location and land quality do not make them (either presently or potentially) more valuable as urban or recreational lands than for agriculture and forestry. A consideration of the present pattern of agricultural development with their location indicates their suitability for an organized scheme whereby (i) agricultural development may be consolidated and extended on land with the best agricultural potential in the Cochrane Clay Belt and with due consideration to location and state of development, (ii) all potentially good forest lands may be fully used for forestry until required for agriculture.

Only Blocks A, B and C are included in this grouping since it is considered that these and similar areas in the Cochrane Clay Belt will provide sufficient acreage for agricultural development in the next 100 years. Both farm and forestry units have been established within these blocks (see Maps Nos. 6 and 9). A schedule has been established which will provide for a progressive development of agriculture on lands with the highest potential relative to their location. Integrated with this agricultural schedule is a forestry schedule which provides for long-term or short-term forestry depending upon the present ownership and condition of the forest land, and upon the probable period during which it will be left in forestry. The long-term forestry units are shown on the Multiple Land-Use Plan. The short-term Crown forests are presented on the Forest Land-Use Plan (Map No. 9). The extent and condition of present forest growth within these blocks are presented on the Forest Cover Map (No. 7).

Table 22

RATING OF PRESENT AND RECOMMENDED LAND USES WITHIN BLOCKS

| Block | Period | Agriculture | Forestry | Wildlife | Recreation |
|---|---|---|---|---|---|
| Block A | 1910-1960 | sub-major | major | minor | minor |
| | 1960-1980 | major | minor | minor | minor |
| | 1980-2000 | co-major | co-major | minor | minor |
| | 2000-2060 | major | sub-major | minor | minor |
| Block B | 1910-1960 | minor | major | minor | minor |
| | 1960-1980 | minor | minor | co-major | co-major |
| | 1980-2000 | co-major | co-major | sub-major | sub-major |
| | 2000-2060 | co-major | co-major | sub-major | minor |
| Block C | 1910-1960 | minor | major | minor | minor |
| | 1960-1980 | minor | co-major | co-major | co-major |
| | 1980-2000 | co-major | co-major | sub-major | sub-major |
| | 2000-2060 | co-major | co-major | sub-major | minor |
| Block D | 1910-1960 | minor | major | minor | minor |
| | 1960-1980 | minor | co-major | co-major | co-major |
| | 1980-2000 | minor | co-major | co-major | co-major |
| | 2000-2060 | minor | major | sub-major | sub-major |
| Blocks E F G | 1910-1960 | minor | major | sub-major | minor |
| | 1960-2060 | minor | co-major | co-major | co-major |
| Block H | 1910-1960 | minor | co-major | co-major | sub-major |
| | 1960-2060 | minor | minor | co-major | co-major |
| Block J | 1910-1960 | minor | minor | minor | major |
| | 1960-2060 | minor | minor | minor | major |
| Block K | 1910-1960 | minor | major | minor | minor |
| | 1960-2060 | minor | minor | sub-major | major |
| Block L | 1910-1960 | co-major | co-major | minor | sub-major |
| | 1960-2060 | minor | sub-major | co-major | co-major |
| Block M | 1910-1960 | co-major | co-major (also urban use) | | |
| | 1960-2060 | (Urban use, major) | | | |
| Block N | 1910-1960 | co-major | co-major | minor | minor |
| | 1960-2060 | major | sub-major | minor | minor |

(2) Recommended Forestry Areas

These are areas in which forestry is or should be the primary land use. There are two classes of such areas:-

(i) Areas in which there is a high percentage of lands having a fair to good agricultural potential, but which will not be needed for agriculture for at least one forest rotation (Block D).

(ii) Areas in which there is a low percentage of lands suitable for agricultural development and this percentage is so located along large streams that their development would jeopardize the successful control of erosion along the stream banks. These are the protective forest areas of Blocks E, F and G.

Block D is divided into 19 productive forestry units, based on the capability of the land to permanently support farm-forest workers (see Map No. 9 and the text of Forestry Land-Use Plan). Three of these forestry units are located in a former settlement area and are designated as 'interim' to indicate the possibility (very remote) that these will be needed for agriculture within a period too short for planning a sustained type of forest management. It is anticipated that when a statement by the Department of Agriculture of the requirements for agricultural land in the Cochrane Clay Belt is examined carefully, these areas may be placed definitely on a sustained type of forest management. In this case, these would not be differentiated from the 16 permanent forestry units for which a sustained type of forest management is definitely planned at the present time.

(3) Recommended Wildlife Areas

Because of either their nature or of their location, or of both, these are areas upon which with few exceptions, wildlife is the primary land use.

Except where recreational uses, such as boating, is highly developed near summer resorts, fishing, hunting and trapping are the main uses of the creeks, ponds, lakes and rivers. Many aspects of these uses are also of a recreational nature.

(4) Recommended Recreational Areas

The areas reserved for primary recreational use are commonly the banks of lakes and streams, or areas adjoining the Town of Cochrane. Included are cottage sites, parkettes, wildlife preserves and reserve recreational areas. Although these are mainly clay lands, their use for recreational purposes is planned since better sandy areas are not available locally.

# PHYSIOGRAPHIC DESCRIPTIONS AND BASIC PRINCIPLES

# REQUIRED FOR

# PLANNING MULTIPLE LAND USE IN THE GLACKMEYER DEVELOPMENT AREA

LAND-USE RESEARCH SUPPLEMENTS

(To Accompany the Report of the Glackmeyer Subcommittee
of the Northern Region Land-Use Planning Committee)

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Site Section, Division of Research
Ontario Department of Lands and Forests, Maple

1960

## LANDFORMS OF THE GLACKMEYER DEVELOPMENT AREA

### A. Landform, the Stable Basis for Land-Use Planning

#### (1) The Definition of Landform

Landforms are defined in terms of the relief of the land and of the geologic materials with constitute this relief.

The relief feature most generally considered in defining landform, is the slope pattern, classified primarily on the basis of mode of origin of the landform but with a view to indicating significant patterns of crop productivity.

Fabric of geologic materials is the other major feature considered in the definition of landform. Fabric refers to (i) the size and shape of individual rock particles or masses, and (ii) the manner in which these particles and masses are aggregated. Fabric deals with the sorting and other arrangements of clay, silt, sand and stones within the matrix and with the degree of cementation and compaction. Fabric of geologic materials corresponds to structure in soils but reflects geological, rather than soil-forming, processes. In this study, the classes of fabric are based primarily on the mode of origin but with a view to indicating significant patterns of crop productivity.

The landform concept is universal in application, since areas of similar slope patterns and similar fabric are classified as the same landform irrespective of their regional location. Furthermore, landforms are relatively stable features, changes in landforms being largely restricted to stages in the geologic cycle. Because of this stability, landforms are the most suitable natural land features within which the developing patterns of physiographic and biotic sites may be interpreted.

Although the landform, itself, remains the same, the patterns of physiographic and biotic sites, which may develop upon it, vary from one climatic to another. Thus a landform classification is not, in itself, an all-sufficing universal system. It is merely the stable reference base upon which changes in soil and vegetation types may be measured and interpreted in terms of land-use capabilities.

#### (2) The Classification and Mapping of Landform for Land-Use Planning

In this report, landforms are classified and mapped to indicate areas which are characterized by patterns of relief and materials which have similar and contrasting effects upon crop production in the Cochrane Clay Belt. Thus this landform classification is indirectly a classification of crop productivity

patterns. Associated with differences in relief and parent soil materials are all the features which constitute the physical controls of crop production within a climatic region. The relief and material patterns of landform provide the basis for establishing patterns of soil moisture, nutrient availability within soil profile types, also patterns of local climates. These are the factors which together control natural forest succession and which man must recognize in the management of the land.

Thus the landform classification used in this study would not necessarily be the landform classification devised by a geologist for this area, since the objective of a geological classification of landform is to demonstrate mode of origin and stratigraphy rather than land-use patterns. Nevertheless, it is features of the landform and not of land use which are the criteria used in the initial definition of the types. The interpretation of these types for land-use purposes is accomplished through the superimposition of landtypes and physiographic sites upon the landform base. (See Research Supplement II,pages 124 to 132 also Research Supplement III pages 150-158).

B. General Statements Concerning the Landforms of the Glackmeyer Development Area

(1) The Landform Province

The Glackmeyer Development Area is part of the Clay Belt of Northern Ontario and Quebec. In Ontario it lies chiefly in the District of Cochrane and in Quebec it is located mainly in Abitibi County. It is a gently sloping plain, dominantly of clay materials, but broken by the following features:-

(i) Plains and trains of sand and gravel,

(ii) Bedrock outcrops,

(iii) Peat swamps and muskegs.

The surface clay deposits are not generally post-glacial lake deposits, although they are frequently so classified. Shoved varved and homogeneous tills constitute a greater proportion of the surface deposits than do the undisturbed varved clay and silt of the most recent post-glacial lake.

The lime content of these varies from one part of the Clay Belt to another. In Ontario there are three classes, namely:-

(i) Moderate lime, occurring in a limited area around Lake Abitibi,

(ii) High lime, over most of the eastern part of the Cochrane District,

(iii) Very high lime, in the western and northern part of the Cochrane District.

## (2) The Origin of the Landforms of the Glackmeyer Development Area

The majority of the materials comprising the landforms of the Glackmeyer Development Area is of glacial origin. Deposits of recent origin include accumulations of peat, widely distributed throughout the area, and extremely local areas of alluvium. Although the surface deposits are of late-glacial and post-glacial origin, the surface relief reflects, to a considerable degree, underlying formations, namely glacial deposits of early glacial periods and bedrock of the Precambrian era. The origin of the landforms of the Development Area was considered in this study only in as far as it was helpful in classifying and mapping land areas which are characterized by similar patterns of effective relief and material. Most of the ice-laid materials differ from 'typical' till in the following ways:-

(i) Clay and silt, stone-free, or relatively so, is the dominant texture.

(ii) Many of the stones are rounded.

(iii) Lenses or broad sheets of distorted or shoved varves are prevalent.

These features suggest that the last glacier in the area overrode broad lacustrine and glaciofluvial deposits and derived its load largely from these lake-laid clays and stream-laid sand, gravel and boulders.

Areas of more typical clay till occur which is characterized by a heterogeneous mixture of silty clay in which stones are imbedded, which vary in size from small grit to large boulders, and a large proportion of which are angular in shape.

Three main types of till are considered to be of significance in crop production, namely:-

(i) Impermeable basal till (lodgment till),

(ii) Moderately permeable shoved varved silty clay till (englacial till),

(iii) Somewhat permeable dumped silty clay loam till (ablation till).

Basal till originates when materials are pushed into place by an advancing ice sheet. F.R. Flint in "Glacial and Pleistocene Geology", 1957, classifies this as lodgment till. If these materials have a relatively high clay content, the resulting deposit has a massive structure which is almost impermeable to water and root penetration. Consequently, basal till occurring close to the surface has a profound effect upon crop production. The deposits of

shoved varved silty clay till are dervied from beds of varves. These varves are alternate layers of silt and clay which represent summer and winter deposits in a glacial lake. These beds have been warped and distorted, either by the overriding of the ice or by having been actually picked up by the ice and carried by it either within or on top of the ice sheet. Such deposits are somewhat more permeable than undisturbed varved clay and silt due to the irregularity of the layering and included lenses of heterogenous till.

Somewhat permeable dumped (ablation) silty clay loam till originated wherever the glacier load was derived from an earlier till or of materials which, though of lacustrine and kame origin, had subsequently been thoroughly mixed.

Sand and gravel deposits laid down by streams flowing through over or away from the melting glacier ~~deposits~~ are known collectively as glaciofluvial deposits. These include broad cone-shaped hills (kames), narrow knife-shaped ridges (eskers), and broad sand areas, outwash plains often with small kettle-like deposits. In the Glackmeyer Development Area most sand and gravel deposits are of an earlier glaciation since they are covered with clay till. There is sufficient evidence to assume that these are long trains consisting of a series of kames connected by eskers, ridges and outwash plains. Since it is generally in the kame areas that the sand and gravel appear near the surface, this landform is used to name all areas which are influenced by underlying glaciofluvial sand and gravel regardless of their specific form. These glaciofluvial trains of sand and gravel occur at intervals from two to seven miles.

The relief which characterizes the glacial formations mentioned above is not as clearly evident in the Cochrane Clay Belt as it is in many parts of the world. There are a number of reasons for this, of which the following are the chief:-

(i) The high proportion of the clay in the till,

(ii) The effect of the relief of the underlying deposits on the surface relief,

(iii) The effect of long periods of periglacial climate,

(iv) The masking of the relief of the surface mineral soil by peat accumulation.

Although deep deposits of clay are general throughout the Cochrane Clay Belt and only occasional rock outcrops occur, the relief of the underlying bedrock in the Clay Belt are similar to the bedrock features which are, for the most part, exposed in the Laurentian Shield Area. In this area the prominent features are the large, rounded rock batholiths with gently sloping sides, and

the long, linear and discontinuous rift valleys. The similarity of the overall relief of the clay plain to that of the Shield Area indicates the overlying clay mantle has, for some reason, assumed the relief of the underlying rocky base.

Likewise, in the Glackmeyer Development Area, the outcropping of sand, gravel and bedrock, kame and esker formations have a strong influence on surface relief and drainage.

The way in which the surface materials were deposited during the advance and wastage of the "Cochrane Glacier" is discussed in more detail in the following sections. The degree to which the underlying deposits influence the relief and drainage conditions of these deposits is also outlined.

## C. Detailed Description of the Landforms of the Glackmeyer Development Area

### (1) The Landform Map

This map (No. 1) shows a generalized picture of the location and extent of the landforms of the Glackmeyer Development Area. Arrows radiating from a centre, mark the inferred location of the buried rock bosses which were 'located' through a study of the surface relief. Bosses which appear to have a marked influence on surface relief are indicated by solid shafted arrows. Those which have only a moderate influence are shown by broken arrows.

It will be noted that in many cases, bosses are overlain by drumlins, in which case the bosses undoubtedly caused the lodgment of basal till. Several bosses are overlain by clay-capped kames which indicates that the sand and gravel drift of this landform must have been deposited originally in englacial streams, the beds of which were above the highest point of the bosses. The subsequent ice-advance deposited clay till on top of this sand and gravel.

The landforms shown on the map are described in the following sections. The criteria used in mapping landforms were established through an integrated study of the significant features on the ground and of the recognition of these features on aerial photographs.

### (2) The Clay Drumlin Landform

#### (a) Short Description

The clay drumlin landform is a gently sloping area of land, generally of an elongated oval shape, and dominated by moderately massive basal till materials.

(b) Origin

As the ice advanced over areas of varved clay, it picked up a basal load of clay. This clay was lodged on bosses and other rock ridges, or as mentioned below, on elevated areas of the clay-capped kame landform. The subsequent action of the ice was to shape this clay into drumlinoid forms with their long axis in a north-south direction, roughly parallel to the direction of movement of the ice sheet. During the ablation (wastage) phase of the Cochrane Advance, the drumlins were mantled with a deposit of superglacial (ablation) till usually in the form of a sag and swell deposit.

The basal till formed during the advance of the ice sheet is the characterizing feature of this landform. There is little evidence of the influence of either underlying or overlying materials. Since it is the material (basal till) and not the characteristic strong drumlin relief (whale back) which defines this landform, it could be described more accurately, but more awkwardly, as drumlinoidal.

(c) Slope Patterns and Fabric

The drumlins of the Glackmeyer Development Area are only slightly elevated above the land which immediately surrounds them. Furthermore, their sides are gently sloping, hence they are often not obvious in the field, nor are they, in most cases, obvious from a stereoscopic examination of aerial photographs of a scale of 4'' to one mile. These landforms can be located from a study of stereoscopic pairs of aerial photographs of a scale of 1'' to one mile.

The fabric of the geologic materials which characterize this landform is the massive basal till. However, permeable silty clay loam or shoved varved clay and silt tills may overlie the basal till on the larger drumlins to a depth which renders the basal till less effective.

The microrelief of the larger drumlins is usually that of the sag and swell till sheet which caps them. The relief of the smaller drumlins is usually smooth, though minor sags and swells sometimes occur. The configuration of the underlying bedrock is rarely reflected in the surface relief of the local drumlin.

Broadly viewed, clay drumlins are very gently sloping areas usually located on the most elevated portions of very broad batholithic bosses. They also occur as drumlin caps on kame and esker ridges where their slopes are usually more pronounced than on the batholithic bosses.

### (3) The Clay-Capped Kame Landform

#### (a) Short Description

The clay-capped kame landform is usually a broadly rolling area of land, dominantly of clay but with local areas of sand and gravel outcrops. It is broken locally by short, moderate to gentle slopes which reflect the kame and kettle topography of the underlying sand and gravel deposits.

#### (b) Origin

During the advance of the ice sheet over the glaciofluvial kame and esker deposits, the flow of ice usually did not modify the relief of these areas. In some local areas, clay till was mixed with sand and gravel to produce a stratum of loamy basal (lodgment) till. On the sides of the glaciofluvial deposits and on local elevations within these areas, the advancing ice sometimes laid down elongated drumlinoid deposits of basal till. On other local areas (for example, the site of the post office in the town of Cochrane) basal till was lodged on the underlying gravel but was not shaped by the ice to a drumlinoid form. During the ablation (wastage) phase of the Cochrane Advance, clay till was dumped on all areas of the clay-capped kame landform which are found in the study area.. These deposits are sufficiently shallow, however, that the topography of this landform reflects the broken kame and kettle relief of the underlying drift. The dumped till is predominantly a loose superficial silty clay till, though there are local areas of relatively undisturbed shoved varves (englacial till).

#### (c) Slope Patterns and Fabric

The clay-capped kame landform includes only those areas where the underlying glaciofluvial drift is sufficiently close to the surface to assist the internal drainage of the overlying till or in some other manner affects their productivity. The parent soil material is dominantly a homogeneous silty clay loam, but local areas of shoved varved till, stony, loamy and silty sand, and basal clay also occur. Loam and silty clay loam deposits sometimes occur on the surface of the landform to a depth of 1 foot, and it might be expected that in such cases the water-laid sands and gravels would be found directly beneath these surficial deposits. These deposits, however, overlie a considerable depth of till which, in turn, overlies the glaciofluvial drift.

The surface topography of the kame landform reflects the broken kame and kettle relief of the underlying glaciofluvial deposits. The sag and swell form of the till sheet often adds further to the brokenness of the relief. Hence a general description of the relief of this landform is an undulating terrain with slopes of moderate steepness.

The character of the relief of drumlins which were formed on the kame landform (shown as the DK landform on the map) is more similar to that of a sag and swell till sheet than to that of the typical clay-capped kames.

(4) The Troughed Clay Plain Landform

(a) Short Description

This is an area of land characterized by numerous peat-filled clay troughs which vary from one to several chains in width and are commonly up to 10 feet in depth and which criss-cross one another at all angles.

(b) Origin

These are areas of moderately deep till (varying from three to thirty feet in depth) overlying bedrock. The manner in which the ice melted after laying down these deposits must have been such that the fractures in the underlying bedrock are essentially reproduced in the surface relief.

~~This landform is similar to the clay drumlin landform insofar as mode of origin is concerned, although superglacial till rather than basal till is the~~

(c) Slope Patterns and Fabric

This landform is similar to the clay drumlin landform insofar as mode of origin is concerned, although superglacial till rather than basal till is the dominant parent soil material. The mineral soil material is dominantly a high lime silty clay, either a shoved varved or a typically heterogeneous till. The troughs are usually filled with peat.

With regard to surface relief, several subtypes are included in this landform which may be summarized as follows:-

(i) Smooth till plains with surface relief only slightly broken by troughs.

(ii) Sag and swell deposits of till on gently undulating bedrock where the effect of the bedrock trough may be exaggerated by the sag and swell of the till sheet.

(iii) Sag and swell till deposits on moderately rolling bedrock where the differing vegetation cover of (a) the better drained swells over bedrock knobs, and (b) the poorly drained sags which overlie depressions in the bedrock, produce a striking mosaic on the aerial photographs.

Generally, the relief of this landform may be summarized as a dominantly smooth terrain with some moderately rolling areas.

*View of a clay plain showing a trough which crosses the field in the middle ground of the photo. Although at present the trough does not pose serious problems for the farm manager, a great deal of effort was required to incorporate the peat of the trough with the underlying mineral soil and to break up the compact surface soil layer. Even today during, and for some time after, prolonged rainy periods, water collects in the trough, saturating the soil and reducing soil aeration. These effects are reflected in crop yields.*

(5) The Stream-Dissected Clay Plain Landform

(a) Short Description

This is a relatively smooth clay area sparingly broken by broad, shallow, peat-filled channels within which present streams sluggishly follow a meandering course.

(b) Origin

The clay materials which constitute the plain generally are part of a shoved varved till sheet which may be locally modified by the planing action of a post-glacial lake and by shallow deposits of varved clay and silt.

It is probable that the shallow stream courses were eroded during the wasting-away of the ice sheet. Up to and during the xerothermic period those courses doubtless provided good drainage.

As the climate became cooler and more humid, internal soil drainage became poorer and peat accumulated over broad areas. This was accompanied

be a decrease in the flow of run-off water and a large proportion of the stream courses became clogged and filled with peat.

(c) Slope Patterns and Fabric

The plain on which the broad, shallow stream courses have been eroded is a gently sloping sag and swell till plain, locally smoothed by the erosion and deposition of post-glacial lakes.

The over-all gradient of the clay deposits would normally provide good drainage. However, the development of peat up the slopes considerably reduces the area of free run-off. Since the presently peat-clogged stream channels form a connected system which once functioned adequately, the former good drainage may be fairly easily re-developed by ditching and removal of the peat.

In general, this landform is smoother than the troughed clay plain.

(6) The Gully-Dissected Clay Plain Landform

(a) Short Description

This is a stream-dissected or troughed clay plain, which subsequently has been moderately or strongly dissected by gullies formed by streams flowing into large rivers whose base levels are much lower than the surface of the plain.

(b) Origin

The gullies have been produced by recent, fast-moving streams, resulting in a short dendritic pattern of narrow, deep gullies.

(c) Slope Patterns and Fabric

In the typical areas, gully erosion has proceeded to the point where very little of the original smooth surface of the plain remains, most of the area being frequently broken by deep, steeply sloping gullies.

Areas in which the plain is broken at frequent intervals, at least every ½ mile, are included in areas mapped as this landform.

Areas in which gully erosion occurs less frequently than at intervals of ½ mile are generally included in a landform characterized by some other slope pattern, commonly the stream-dissected and troughed clay plain landforms.

(7) The Lower Clay Slope Landform

(a) Short Description

This is a depression landform. It is made up of poorly-drained lower slopes between clay drumlins and clay-capped kames which cannot be designated as either of these upper slope types, since the underlying formations have little or no effect upon their character. Another characteristic which all lower slopes possess is the presence of water enriched by oxygen and nutrients (telluric water) which originates up slope and flows along the surface of these slopes.

(b) Origin

These slopes have been formed by superglacial clay slumping into depressions between kames and drumlins.

(c) Slope Patterns and Fabric

The slopes are generally gentle on the flanks of the drumlin and kame areas and very gentle in the centres of the depressions. The fabric varies according to the associated landforms; basal till areas are common.

(8) The Channel-Like Clay Depression Landform

(a) Short Description

This is a broad linear depression, usually with relatively steeply sloping flanks and poorly drained bottom lands. (These are associated with rift valleys in the bedrock which are shown on the Landform Map (No. 1) by broken lines.)

(b) Origin

These broad, generally deep, depressions in the clay till sheet have been described by the author, in the past, as channels formed by streams of meltwater flowing from the wasting ice sheet. Scattered shallow deposits of sand and gravel do occur in some of these depressions, suggesting that they may have been used by streams larger than those which now occupy but a small part of the valley bottom.

However, it has been impossible to piece these depressions together into a satisfactory periglacial drainage system. A more logical explanation of their origin has arisen from the following observations:-

(i) The relief pattern of these depressions resemble that of the rift valleys found in areas of Precambrian bedrock

covered with shallow drift. The sides of the depressions are roughly parallel and continue in a comparatively straight line for some distance, often for several miles at least. Two or more depressions intersect at angles which suggest the geometrically formal pattern of faulting rather than an informal erosion pattern.

(ii) On the edge of these depressions, bedrock outcrops have been found which have perpendicular sides, approximately parallel to the linear side of the depression.

Accordingly, it is postulated that these channel-like depressions occur where the rift valley in the bedrock has not been completely filled with glacial drift. This landform is another feature suggesting that the irregularities of the underlying bedrock were not smoothed out by the deposits of the glacier and the post-glacial lakes. The reasons for this are not known. It is suggested, however, that the bedrock depressions were filled with ice which the glacier overrode, and on top of which it deposited the till sheet. When this ice finally melted, perhaps during the xerothermic period, the slumped till sheet only partially filled the rift valley.

(c) Slope Patterns and Fabric

The central portion lying over the rift valley, is usually a shallowly depressed valley in cross-section and almost level in longitudinal section. From this central portion the land generally slopes gently upward to the level of the surrounding clay plains. When the channel-like clay depression landform is associated with the clay-capped kame landform, for example in the area where Clute Creek crosses the Cochrane-Clute Road, it occurs as a much deeper valley. The fabric of the geologic material is dominantly a homogeneous clay till, although there are areas in which this clay is covered by loamy till and partially sorted sand, gravel and clay materials.

RESEARCH SUPPLEMENT II

## LANDTYPES AND PHYSIOGRAPHIC SITES OF THE GLACKMEYER DEVELOPMENT AREA

### A. Landtypes and Physiographic Sites Provide the Detailed Physiographic Basis for Land-Use Planning

Landtypes are areas having a relatively narrow range in texture and petrography of parent soil materials within a climatic region. Landtypes are subdivided into subtypes on the basis of the slope and fabric patterns discussed under landform (Research Supplement I). These are again subdivided into physiographic site types on the basis of classes of soil moisture, depth over bedrock, and ecoclimate.

Regional climate and vegetation interacting with landform features have produced the pattern of physiographic sites shown on Map No. 2.

These physiographic features (combinations of landform and climate) provide the frame of reference for evaluating crop productivity and land use. Thus physiographic site types are the basic units within which and between which comparisons can be made regarding differences in the development of natural forest succession and differences in the effect of management on crop production. See pages 43 to 47 for elaboration of this principle.

The vegetation aspect of site will be discussed in Research Supplement V.

Since the effect of regional climate upon the development of vegetation on the physiographic sites of an area will vary with differences in the local climate and landform features of these sites, effective climates must be gauged by a study of the development of vegetation on specific physiographic sites. Areas which have a narrow range of effective climates, determined in this way, are known as site regions. The boundaries of site regions are so established that (i) within any site region, the effect of climate is such that the development of vegetation through all its stages in succession is relatively uniform upon any given physiographic site, and (ii) that this development differs from the development on a similar physiographic site in an adjacent region. In demonstrating this theory, site regions have been described on the basis of the climax or most stable vegetation which occurs on nine physiographic site classes (a combination of 3 ecoclimate classes with 3 soil moisture classes).*

* G. A. Hills, "Field Methods for Investigating Site, A. The Detailed Site Description Form", October, 1954.

B. The Classification of Regional and Local Combinations of Climate and Landform Features

(1)

(i) Regional Climate

As stated above, regional climate has been defined for forest site research in terms of its effect upon the development of forest succession on various landform features. The Glackmeyer Development Area is located in the Lake Abitibi Site Region of the Province of Ontario (Site Region 3E)* The climax forest types which occur on the nine physiographic site classes of this region, which is summarized in Table 23, illustrate the variations in the effect of regional climate upon the development of vegetation.

Table 23

CHARACTERISTIC FOREST ASSOCIATIONS OF SITE REGION 3

| Physiographic Site Classes | | Climax Forest Type |
|---|---|---|
| Ecoclimate | Soil Moisture | |
| Hotter than Normal | Dry | Jack Pine, Black Spruce |
| | Fresh and moist | White, Red and Jack Pine, White Spruce |
| | Wet | Balsam Poplar |
| Normal | Dry | Jack Pine, White Birch |
| | Fresh and moist | Balsam Fir, White Spruce, Aspen and Balsam Poplar |
| | Wet | Black Spruce, Balsam Fir |
| Colder than Normal | Dry | Black Spruce, Larch |
| | Fresh and moist | Black Spruce, Larch |
| | Wet | Mosses, Lichens |

* G. A. Hills, A Ready Reference to the Description of the Land of Ontario and its Productivity. Ontario Department of Lands and Forests July 1959.

(2) Soil Materials

Broad soil material classes for Ontario have been established. This classification is based on (i) the texture of the fine skeleton of the parent soil material, and (ii) the petrography class of (a) the coarse skeleton, and (b) the rocks from which the fine skeleton has been derived. The petrography classes have been established to indicate the availability of nutrients to plants under various conditions of geologic and soil weathering, rather than to indicate the mineral constituents of the coarse skeleton.

Research Supplement I indicates that the variations in the texture of the inorganic parent materials of the landforms of the Glackmeyer Development Area range from heavy clay through silty clay, which is dominant, to a light clay loam. Because these variations do not greatly affect crop production or vegetative succession in this area, and in order to avoid excessive detail, one textural class, a clay, has been recognized. As mapped, this is in effect a pattern of texture classes. In addition, one class of organic parent soil material has been recognized. The petrography class of the clay is rated as high lime, the organic material as an acid peat. Hence the landtypes of Site Region 3 which occur in the Glackmeyer Development Area are (i) the Cochrane landtype, a high lime clay of poor structure, and (ii) the Jessop landtype, an acid peat.

(3) Relief

A general description of the relief of the landforms of the Development Area is given in Research Supplement I. Further discussion of relief may be found below, under the heading of ecoclimate, in which the combined effects of relief, parent soil materials and vegetation are discussed.

(4) Soil Moisture

The soil moisture regime classification is designed to indicate soil moisture conditions, both in time and space, which reflect major variations in relief and parent materials within each climatic region. On such combinations of relief and parent material, significant associations of vegetation and fluctuations in soil moisture may be recognized. Soil profile development is an excellent indicator of soil moisture regime within each climatic region. However, because the rate of soil profile development varies with factors other than soil moisture (e.g. type of humus as controlled by type of forest or other cover), profile development must be used in conjunction with these factors to assess soil moisture regime ratings. An eleven class moisture regime scale has been established which covers the full range of soil moisture conditions of a region.

Diagram 3 illustrates the soil profile development and humus conditions which are associated with the moisture regime classes which are found on moderate to high lime clay and silt with poor structure. It will be noted that humus conditions, or more particularly the accumulation of raw humus and peat, are considered in combination with soil profile development. Severe fires and disturbances by man have altered the humus conditions of extensive character of the various soil horizons is the criterion for assessing the soil moisture regime and productivity rating.

To map the patterns of soil moisture conditions of the landtypes of the Development Area, the following grouping of moisture regime classes has been used:-

| Symbol | Moisture Regime Class |
|---|---|
| f | 1, 2 and 3 |
| tf | 3 and 4 |
| m | 4, 5, 6 |
| tm | 6 and 7 |
| w | 7, 8, 9, |
| s | 9 |

(5) Ecoclimate

Ecoclimate, the climate which actually regulates the growth of vegetation, is the local surface climate of the atmosphere extending from the rooting zone to a few feet above the tops of trees. Ecoclimate, in its potential aspect, may be gauged from a study of local landform features, of which the combined features of relief and permeability of geological materials are the most significant. A reference point within the regional scale, which allows for comparison between regions, is the normally effective relief class. This is defined as that gentleness of relief which, when associated with normal materials having normal retention of water and a normal supply of effective chemical elements, permits the regional climate to be normal in its effects on the development of soil profile and vegetation.

In general, the structure of the Cochrane clays does not permit the free movement of water and air through the rooting zone and thus reduces the effectiveness of the regional climate unless this is offset by favourable relief. This slowly permeable structure is dominant on the drumlin, the troughed till, and stream-dissected landforms. It also occurs locally on the clay-capped kames in areas dominated by heavy basal till. Generally, however, the 'dumped' superglacial or englacial till of these kame areas contains a high percentage of sand, gravel and stones and its more permeable structure permits water and air to move with greater freedom, particularly if underlain by sand and gavel a few feet from the surface.

# GENERALIZED SOIL PROFILES

## ( Under Undisturbed Natural Forests )

## POOR STRUCTURED, HIGH LIME CLAY AND SILTY CLAY
## COCHRANE CLAY BELT

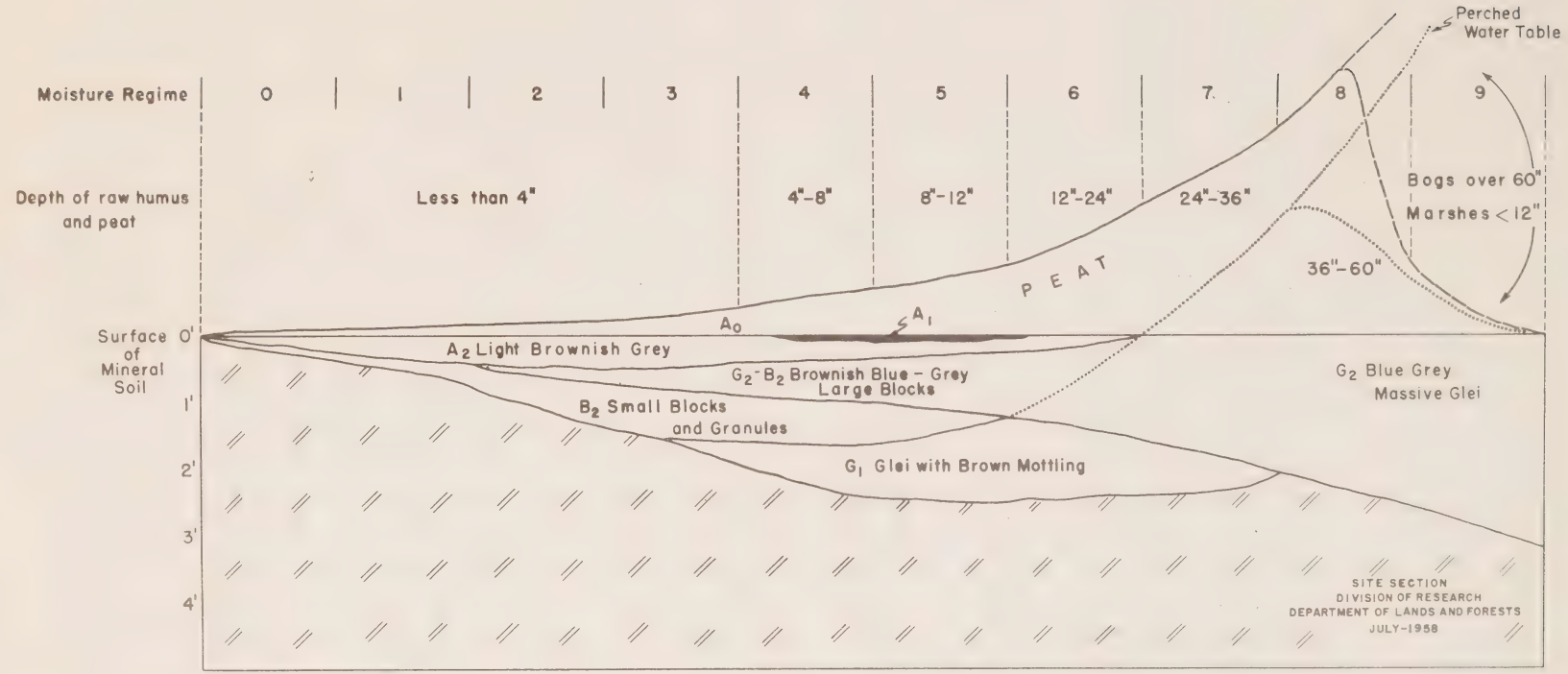



Diagram — 3

There are two main types of relief which increase the effectivity of regional climate:-

(i) broad valleys with good air drainage,

(ii) elevated ridges with favourable aspects and internal soil drainage.

Thus areas of the clay till plains which are dissected with steep sloping gullies will have a warmer than normal ecoclimate along the banks of the Abibiti and Frederickhouse Rivers. Local areas with favourable aspects on the larger drumlins will likewise have a warmer than normal ecoclimate. These ecoclimates, however, occur most generally on those areas of the clay-capped kames where both the type of geological materials and the relief are combined to render regional climate more effective.

Ecoclimates which are normal for the site region are common on the larger drumlins as well as on a considerable portion of the clay-capped kame areas.

The colder than normal ecoclimates are characteristic of the muskegs and black spruce flats and frequently extend over a large proportion of the smooth moist areas of Cochrane clays.

## C. The Physiographic Site Patterns which Characterize the Landtypes of the Glackmeyer Development Area

Physiographic sites, patterns of which characterize landtypes, are commonly classified by the features of soil moisture, ecoclimate and depth over bedrock. However, patterns of moisture regime are the only features used to show subdivisions of the landtypes on the maps which accompany this report. Patterns of ecoclimate may be inferred from landtype classifications, particularly if slope and fabric patterns are mapped and described. Since bedrock seldom occurs close enough to the surface in the Development Area to influence crop productivity, further reference to this feature in the description of the area is not necessary.

The following descriptions are presented with a view to show how patterns of soil moisture and ecoclimate are related to the various landtypes. Detailed discussions of soil profile development and the soil profile patterns associated with combinations of all the physiographic features are presented in Research Supplement III, pages 133-158.

### (1) Physiographic Sites of the Cochrane Kame Landtype

Normal ecoclimates are dominant on this landtype. However, as discus-

sed in the above section, the proportion of warmer than normal ecoclimates within this landtype is greater than that of any other landtype occurring in the Glackmeyer Development Area. These warmer than normal ecoclimates occur most frequently on those aspects of the steeper slopes which are exposed to warm and drying air currents. Small areas of colder than normal ecoclimates occur on the lower slopes, depressions and potholes.

The sites of the Cochrane kame landtype are dominantly fresh. Accordingly, on undisturbed sites, zonal soils and climax spruce-fir-intolerant hardwood forest types develop. Moist sites may occur locally on lower slopes and wet sites are found in local sags and potholes. See pages 44-46, 153.

The potential nutrient level of the geologic materials is moderately high. Where soil weathering has reduced the calcium concentration below the toxic level and where the release of nutrients is maintained by humus decomposition the available nutrient level is at the optimum for the landtype. However, when these soils are cleared for agricultural crops, the available level of nutrients is moderately low because of the intense weathering of the leached (A2) horizon. A good humus must be built up by farm practices in order that there is a good supply of nutrients for the farm crops. A more detailed discussion of nutrient availability is presented in ~~Research Supplement~~ III.

for soil type pattern see page 11

(2) Physiographic Sites of the Cochrane Drumlin Landtype

The gentler slopes and the relatively smaller mass of elevated land of the clay drumlins relative to the Cochrane kame landtype do not greatly modify the regional climate. Consequently, the dominant ecoclimate of the clay drumlins is normal for the site region. Sites with colder than normal ecoclimates occur more frequently on the Cochrane drumlin landtype than ~~on the Cochrane drumlin landtype than~~ on the Cochrane kame landtype.

A change in forest type on these colder than normal sites may initiate a change from decomposing humus to an accumulating moss humus. This, in turn, may result in poorer drainage and a still cooler ecoclimate.

The above statements apply to those clay drumlins which are common on the smoother clay plains. The drumlins which cap the kames, shown as the DK landform on Map No. 1, have an ecoclimate similar to the Cochrane kame landtype.

The sites of this landtype are dominantly fresh, even though on the larger drumlins moist sites occur more commonly than on the Cochrane kame landtype. Moist areas occur locally on both the flanks and tops of drumlins.

On those moist sites with accumulating moss humus, the actual availability of nutrients may be less than if there were no humus accumulation whatsoever.

on the Cochrane drumlin landtype than

Because the proportion of these sites is greater on the Cochrane kame landtype, the overall productivity of the drumlin landtype is less than that of the kame landtype. For soil type pattern see P. 154.

(3) Physiographic Sites of the Cochrane Stream -Dissected Plain Landtype

(a) Smooth Areas Dominated by Shallow Meandering Channels, Partially Peat Filled

It is probable that the shallow stream courses were eroded during the wasting-away of the glacier. Drainage conditions deteriorated subsequent to the xerothermic period, owing to the gradual accumulation of raw peat on the area generally, and to the stream channels likewise filled with peat. They form a connected system and are, therefore, a potential drainage system for this landtype. Peat removal would be necessary in order to realize this potential.

The ecoclimates of the sites of this sub-landtype are generally colder than the normal for the site region. The sites are dominantly moist, with wet sites occurring locally in the peat-filled channels. The actual available level of nutrients in these peat-covered clays is somewhat lower than that of the clay materials without a covering of peat. For soil type pattern see P. 155.

(b) Broken Areas Dissected by Steep Sloping Gullies

Since these areas are commonly adjacent to larger streams, the ecoclimates are either normal or warmer than normal.

The moisture regimes are fresh on the fringe areas along the stream bank. Areas between the streams are generally moist or wet. If the gully erosion is recent, moist and wet sites may occur on the very top of the eroded slope. This overhanging of wet peat soil on steep clay slopes indicates that the erosion of these wet areas occurred after the peat had developed.

The potential nutrient level of the soils of this sub-landtype is similar to that of the meandering channel landtype under similar ~~dept~~ of peat. On the areas more recently eroded, however, the high lime parent material is generally closer to the surface and will have lesser productivity until the slopes are stabilized and soil leaching brings about a reduction in lime content and greater availability of other nutrients. For soil type pattern see P. 155.

(4) Physiographic Sites of the Cochrane Troughed Plain Landtype

The ecoclimates of the sites of this landtype are dominantly colder than normal for the site region. The sites are dominantly moist, though local fresh

areas often occur as narrow, slightly elevated strips adjacent to the troughs, and local areas of wet sites sometimes occur in the troughs. The areas of fresh sites, however, are seldom large enough to establish a normal ecoclimate. The actual availability of nutrients is similar to that of the stream-dissected plain landtype. For soil type pattern see page 156.

(5) Physiographic Sites of the Cochrane Channel Landtype

The ecoclimates of the sites of this landtype are dominantly colder than normal for the site region. The moisture regime is dominantly wet with local areas of moist sites. The combined relative potential of effective chemical elements of peat and shallow peats is appreciably lower than the potential of the underlying mineral materials. For soil type pattern see page 157.

(6) Physiographic Sites of the Cochrane Lower Slope Landtype

This landtype has a limited occurrence on the lower slopes of the kames and drumlins.

The ecoclimate of these lower slopes and depressions varies according to air drainage. Normal ecoclimates are more common here on moist and wet areas than on similar moisture regimes on other landtypes because of the better air drainage.

The sites of this landtype are enriched by the transport of nutrients in the waters which move down the slopes, hence the moist sites of this landtype have a higher actual availability of nutrients than the moist sites of the stream-dissected and troughed plain landtypes.

For soil type pattern see page 158.

# SOIL TYPES OF THE GLACKMEYER DEVELOPMENT AREA

## A. The Soil Forming Processes

Soil forming processes are those interactions through which the combined effect of living organisms and climate upon geological materials produces change in the appearance of the surface layers of these materials. The appearance of the surface layers prior to the establishment of vegetation reflects their geological origin and is similar to that of the deeper unweathered layers of the same origin. However, over a period of years, the combined effect of living organisms and climate upon these geological materials results is distinctive soil layers known as "soil horizons". A specific set of soil horizons at a given point is known as a "soil profile".

Within many climatic regions, the main physiographic features which control the development of soil profiles are texture, structure and chemical composition of the parent inorganic soil material and relief. In the Cochrane Clay Belt, however, peat may accumulate and, underneath the peat layers, clay-pans may develop, on all but the extremely steep slopes. The development of peat and clay-pan modifies, if not overrides, the effect of relief. Since both peat accumulation and clay-pan glei formation are dynamic processes which may be initiated on different areas at different periods of time, there is no consistent relationship between relief and profile development. For example, on some moderate slopes the formation of deep peat and clay-pan glei horizons have produced a wet peat site. This "flat relief effect" continues to operate until the peat and clay-pan layers are removed. On similar slopes on which the peat has not formed, the moderate relief is normally expressed by a somewhat well-drained soil profile. Although a "flat relief effect" may be superimposed on moderate slopes as well as on smooth terrain, the frequency with which the "flat relief effect" is superimposed varies according to the degree of slope within specific patterns of slope and relative mass elevation. For example, the rapidity and frequency with which peat accumulates on moderate slopes on the Cochrane troughed plain landtype is much greater than that on moderate slopes within the Cochrane kame landtype.

## B. The Taxonomic and Mapping Concepts of Soil Units and Their Application to Land-Use Planning

For the purposes of soil classification and land-use planning soil profiles must be examined at three levels, namely:-

(i) Great soil Group
(ii) Soil Type
(iii) Soil Phase

A Great Soil Group consists of a number of soil types having the same number and kind of definitive horizons. Initially, soil taxonomists attempted

to define "definitive horizons" of the Great Soil Groups in such a way that soil types with similar drainage conditions in the same climatic region would belong to the same Great Soil Group. More recently, a broad consideration of parent soil materials has been found to be an essential part of the classification. In the Cochrane Clay Belt three Great Soil Groups are recognized on well-drained sites because of variations in the texture and petrography of the parent materials (see Page 136).

A soil type is an area of land upon which a specific type of soil profile, representative of the Great Soil Group, has developed upon similar parent materials. The allowable range in texture, structure and chemical composition of the parent materials within each soil type is defined by the taxonomist. Different parent materials will produce differences in the appearance of the soil profile. If these differences go beyond the definitive range for a Great Soil Group, another Great Soil Group is established. This integration of soil types and Great Soil Groups requires much time and effort on the part of taxonomists in order to maintain a rigid, useful classification. The taxonomy of the soils of the Greater Cochrane Clay Belt is far from complete at present time. Some of the difficulties which will be encountered in providing a classification which is of practical value, as well as one which is taxonomically correct, are suggested in the following discussion.

Soil Phase is defined by soil taxonomists as "that part of a soil type having minor variations in soil characteristics used in soil classification from the characteristics normal for the type although they may be of great practical importance. The variations are chiefly in such external characteristics as relief, stoniness and accelerated erosion" (Soils and Men, U.S.D.A. Yearbook, 1938, page 1174).

The practical significance of these 'minor' features (minor, because of their role in soil taxonomy rather than in soil productivity) vary from area to area. Some minor features which are of great practical importance in the temperate regions may have little significance in the Northern Clay Belts and other features may assume a role of great practical significance. In this report, soil phases have been established to indicate significant variations within soil type, such as the depth and type of humus, not usually considered as phases in other climatic regions. The reasons for recognizing such phases will become obvious in the following discussion. The problems of establishing a satisfactory taxonomic system which integrates Soil Phases with Soil Types and Great Soil Groups in a practical way for both mapping and description purposes are also introduced.

Soil profiles which are representative of the Great Soil Groups develop slowly on the physiographic sites of an area as a result of the combined interaction of the vegetation and the local climate upon the geologic materials. To be truly representative of Great Soil Groups, soil types should remain

relatively stable for long periods termed pedologic stages. Hence soil profiles representative of Great Soil Groups are valuable indicators of the history of forest type development and of climatic trends. Less stable or otherwise minor variations in the soil profile recognized as phases of soil type are of value in determining local variations in crop productivity and land management. However, it has not been possible for soil taxonomy to include only the significant stable features in soil profiles at the Great Soil Group and soil type levels, and the unstable or less important features at the phase level. All gradations between the two levels are found in the mapping of both soil types and soil phases, an example of which is discussed on page 140.

The representatives of the Great Soil Groups found in the Glackmeyer Development Area are described in Section C. Soil types which are combinations of Great Soil Groups and parent soil materials have been recognized. These are described in sub-section E. Official geographic names for these soil types are not available but can be applied at a later date. The Ontario Soil Survey at Guelph which deals with soil taxonomy in Ontario has agreed to this and has expressed the opinion that the present description of the soil conditions is a sufficient basis on which to discuss principles of land use.

Taxonomic soil types, as presently recognized in soil science, represent relatively homogeneous areas in each of which there is but a relatively narrow range in the following characteristics:-

(i) The texture, structure, colour and chemical composition of the soil horizons. Defined with particular reference to permissible variations within Great Soil Groups.

(ii) The fabric and petrography of the parent geological materials.

In order that a taxonomic soil type can occur over extensive areas, it is necessary that there be little change from one spot to the next in the many factors which control soil formation. This rarely happens in nature. Accordingly, soil type maps frequently distort the concrete expression to a taxonomic soil type, in order to arrive at units of mappable size, unless a scale of 4 inches to 1 mile or greater is used.

Nevertheless, the soil type is used by many institutions as a mapping unit at scales considerably less than 4 inches to 1 mile. In order to prepare maps at lesser scales, it has been necessary to ignore the less commonly occurring types and to map, as a single soil type, all areas in which this soil type dominates the total pattern even though this pattern varies from place to place because of the differences of the other included types. In farm planning and economic surveys, the usefulness of such soil maps has been fre-

quently questioned since such mapping neglects to present the actual pattern of soil types. Neither does it present variations in relief and geological fabric within the mapped area, knowledge of which is also very necessary in rating the capability of land for crop production.

Taxonomic soil types need not be mapped in order to be extremely useful in indicating the differences in soil development on various physiographic positions. For it is possible (i) to map physiographic patterns, (ii) to describe these in terms of the commonly occurring relief and fabric patterns, and (iii) by relating soil types to specific combinations of relief and fabric, to convert the physiographic site map into a map of soil type patterns. Such a map of soil type patterns is useful in land-use studies since it presents a true picture of the various combinations of slope, geologic fabric and soil ile types. Map No. 2 showing physiographic sites may be converted into such a map, through the use of the diagrams in subsection F.

## C. The Great Soil Groups of the Glackmeyer Development Area

The Glackmeyer Development Area is located in a cool, humid, climatic region, dominated by boreal forests. Under this combination of climate and natural vegetation, the following patterns of soil profiles representing Great Soil Groups have developed:-

| | |
|---|---|
| (i) Good soil drainage. | (a) Very high lime clay - Brown wooded<br>(b) High lime clay - Grey wooded<br>(c) Acid soil materials - Podsol. |
| (ii) Imperfect soil drainage. | (a) High base soil water - Dark Grey Gleisolic<br>(b) Moderate base soil water - Grey wooded glei<br>(c) Low base soil water - Grey wooded peat glei. |
| (iii) Poor soil drainage. | (a) Acid peat over high lime clay - peat glei. |
| (iv) Very poor soil drainage. | (a) Acid peat - shallow and deep peat |

### (1) Brown Wooded Soil Profile

The Brown Wooded Soil occurs but locally in the Glackmeyer Development Area. It is characteristically found on areas of very high lime clay parent materials which are too small to separate on the map. It is also found on local areas of high lime.

It is generally accepted that on areas of high lime, the brown-wooded type of soil development has preceded the grey-wooded type of soil development. It is thus postulated that originally brown-wooded soils occupied the entire Glackmeyer Development Area. The transformation from brown-wooded to grey-wooded depends upon the intensity as well as the duration of leaching. Since the type of vegetation has a strong influence on the intensity of leaching, the history of forest succession is an important factor determining the differences in soil profiles on similar materials. Accordingly, brown-wooded profiles are found only locally on high lime clays where the vegetation has been such that leaching has been less intense. On some locations, there is a physiographic explanation to their occurrence, such as an eroding slope on which the limy parent material remains consistently very close to the surface.

A brown-wooded soil profile is characterized by:-

(i) A very thin, dark brown to dark grey horizon in which organic matter is incorporated with the clay (the $A_1$ horizon.

(ii) A thicker layer of brown clay (the B horizon) with little structural differentiation from the underlying parent material.

Generally all the horizons (even the organic $A_0$ horizon, if present) are saturated with calcium, magnesium and other bases.

(2) Grey Wooded Soil Profile

The grey–wooded type of soil development takes place on areas in a boreal climate having a moderate content of lime in the original surface materials. In the Glackmeyer Development Area it is doubtful if there were large areas having such a low content of lime at the surface before soil weathering took place. It would appear, then, that most of the grey-wooded soils which now dominate the Glackmeyer Development Area have developed from the initial brown-wooded soils as described above.

A grey-wooded soil profile is characterized by:-

(i) An ashy grey layer (the $A_2$ horizon), from which clay, calcium, iron, aluminum and other elements have been removed by leaching.

(ii) A chocolate brown layer (the $B_2$ horizon) with a blocky structure in which the clay, iron and aluminium leached from the $A_2$ have accumulated. Generally, calcium is

leached from this horizon, - free lime not being found except in the underlying parent material.

The movement and accumulation of clay in the grey-wooded profile distinguishes it from the podsol. No longer do the soil taxonomists require the layer of calcium accumulation below the B which is so commonly found in the original areas mapped as grey-wooded soils in the Prairie Provinces. The lack of this layer of high calcium concentration as well as the humid climate of the Cochrane Clay Belt render comparisons in forest production between soils of the Glackmeyer Area and those of the Prairie Provinces very weak, if not useless.

(3) Podsol Soil Profile

Podsol soil profiles develop generally on loamy and sandy soils which are well to excessively drained and which are low to extremely low in lime.

The podsol type of soil profile is characterized by:-

(i) An ashy grey $A_2$ horizon from which iron and aluminum have been leached.

(ii) A rusty brown or dark brown $B_2$ horizon in which iron, aluminum and organic matter have accumulated. Unless cemented by iron and humus, the structure of this horizon is not greatly different from that of the materials from which it is formed, there being no clay accumulation as in the grey-wooded soils.

The typical podsol profile occurs but rarely since loamy and sandy soils occur infrequently in the Glackmeyer Development Area. Loam and sand are found only on areas mapped as clay-capped kames (i) where the clay has not completely capped the sand and gravel, and (ii) where the original clay cap has been removed by erosion, exposing the underlying sand or loam.

More frequently encountered, but by no means of common occurrence, is a podsol profile superimposed in the $A_2$ of a grey wooded soil. These occur most frequently in the clay-capped kame areas and in soils in which the texture of the A2 approaches a loam or silt loam. The material in which the podsol process is now proceeding is no longer a moderate lime clay similar to that of the present C horizon, but an acid clay material (the grey wooded $A_2$). In these superimposed podsol profiles, the secondary podsol $A_2$ is very thin and the secondary podsol $B_2$, though often but a weakly developed colour horizon may extend throughout most of the grey-wooded $A_2$.

(4) Grey Wooded Glei Soil Profile

The typical grey-wooded glei soils occur on soil materials which are imperfectly drained, but yet are not impermeable to the degree that a clay-pan glei develops. It is commonly found on transition fresh to moist sites on mid-slope positions on clay-capped kames. Well-aerated ground water moving down slope maintains a good supply of nutrients and enables a forest of white spruce, balsam fir, balsam poplar and aspen poplar to maintain itself.

The characteristic horizons are -

(i) The incipiently gleid $A_2$ horizon (very weak tendency to form a massive glei).

(ii) A mottled B horizon (very weak tendency to form a massive glei).

(5) Grey Wooded Peat Glei Soil Profile

This is actually a peat glei profile superimposed on a grey-wooded profile. Although the materials on which these profiles are found are very slowly permeable, they were sufficiently well drained during the xerothermic period to permit the development of a grey-wooded soil. As the climate subsequently became cooler and more humid, the downward percolation of water through the slowly permeable materials gradually became slower and slower until a clay-pan was initiated in the lower $A_2$ and upper $B_2$.

Thus the grey-wooded peat glei soil profile is characterized by:-

(i) Peat horizon less than 12'' in depth.

(ii) A grey-wooded $A_2$ in the lower part of which horizons iii and iv have developed.

(iii) An $A_2G$ horizon representing a transition from grey-wooded $A_2$ to clay-pan glei;

(iv) A $B_2G$ horizon developed in the upper part of the grey-wooded $B_2$.

(v) A grey-wooded $B_2$ rendered almost ineffective through the development of the clay-pan above it.

Initially the accumulation of peat and the development of a clay-pan glei horizon occurred on smooth terrain. That similar profiles also develop on moderate slopes as superimposed profiles on former grey-wooded soils indicates that the acreage of poorly drained soils is increasing by the extension of peat up the slopes. The important role which vegetation plays in this upslope extension of poorly drained areas will be discussed in Research Supplement V, pages 174-205.

(6) Dark Grey Gleisolic Soil Profile

Dark grey gleisolic profiles rarely occur naturally in the Glackmeyer Development Area. Where present, they are found on moist (imperfectly drained) slopes where telluric water maintains a relatively high base concentration throughout the profile. This permits the growth of mixed deciduous stands, usually with a high content of balsam poplar. The maintenance of a relatively high base concentration throughout the profile also favours the development of a fairly well decomposed humus and a mottled, somewhat permeable glei instead of the raw humus and clay-pan glei which is characteristic of the peat glei soils.

The soil profiles, which develop when poorly drained peat glei soils are brought under cultivation, have also been included in this soil group by soil taxonomists. In these, the peat has been either removed by fire or incorporated in clay-pan glei to form a cultivated $A_1$. The complete transformation of the impermeable clay-pan glei to a permeable $A_1$ permits air and water to penetrate into the upper parent material. The soil profile is now imperfectly drained, and a horizon with iron mottlings develops, similar to those found in dark grey gleisolic profiles.

When the entire clay-pan glei has been eliminated and the transformation from peat glei to a dark grey gleisolic type of profile has been completed, there is some justification for calling it a dark grey gleisolic. However, this designation does not present an evaluation of the genesis and morphology of the soil profile as realistically as do terms which indicate its peat glei origin.

For example, the Demonstration Farm of the Department of Agriculture at New Liskeard is mapped as dark grey gleisolic (Report No. 21 of the Ontario Soil Survey), yet a massive clay-pan glei up to 3 inches thick underlies the plow soil over most of the area. Although the raw peat has disappeared from most of the area, the poor drainage conditions imposed by the glei renders the aeration of such soils much more difficult than mineral soils without a clay-pan glei (i.e. the true dark grey gleisolic soils). The area is actually a pattern of culturally modified peat-glei profiles in all stages of development, from the natural peat-glei profile to the completely developed cultural dark grey gleisolic. Local areas of naturally developed dark grey gleisolics also occur.

(7) Peat Glei Soil Profile

Peat glei soils occur on moist to wet clays. Initially, these soils developed on a flat or a gently sloping relief. Now they also occur on moderate slopes as superimposed profiles on former grey-wooded or brown forest soils indicating that the extent of poorly drained soils is increasing. The initiation of this up-slope advance of poorly drained soils through changes in vegetation will be discussed in Research Supplement V.

The peat glei soils are characterized by:-

(i) A peat horizon, 6'' to 12'' in depth; poorly decomposed organic materials largely derived from sphagnum and other mosses but with a high content of wood.

(ii) A blue-grey clay layer (glei); practically impermeable to water which is very sticky when wet and dries like concrete.

There are many varieties of these shallow organic soils. On some locations a portion of the peat horizon, lying immediately above the glei and varying in depth from a trace to 3'', is fairly well decomposed. This decomposition occurred during the xerothermic period within the A horizon of a dark grey gleisolic soil.

(8) The Shallow Peat Profile

Shallow peat soils develop on flats, gentle slopes and all other locations wherever the accumulation of raw peat and the development of a clay-pan glei becomes initiated.

Shallow peat soils are characterized by:-

(i) An organic layer of 12'' to 36'' in depth; dominantly of raw peat but usually with a few inches of moderately well-decomposed peat above the mineral surface.

(ii) A clay-pan glei usually from 2'' to 6'' thick and practically impermeable to water.

Traces of former, better drained profiles, such as a relic of a B horizon with the glei, are found locally.

The shallow peat profiles differ little from either the peat glei soils or

the deep peat soils, except in the depth of the peat and the thickness and permeability of the clay-pan glei.

(9) Deep Peat Profile

The locations on which deep peat soils occur are (i) local depressions, (ii) the extension of peat up the slope from depressions, and (iii) flat divides between watersheds.

The deep peat soils are characterized by the organic horizon only, since the glei or other mineral horizons are more than 3' from the surface.

Indirectly, the glei or other mineral horizons may influence the soil profiles, in some cases through the supplying of nutrients. Generally, however, materials underlying peat at depths greater than 3' have little influence on productivity. Streams flowing into muskegs often supply the soils immediately along their flanks with aerated water and nutrients. In the case of the latter, the materials through which the streams have flowed before reaching the muskeg have a greater influence on the productivity of these fringe areas than the materials which immediately underlie them.

D. The Role of Soil Profile Dynamics in Land-Use Planning

In order that soil profiles may be used to assist in rating the capability of the land, mere classification is not enough. The conditions under which soil profiles develop must be known in order to determine what changes might be expected in the future. Since it is believed that many of the present horizons have developed during the warmer climates of the xerothermic period and under a different vegetation, it is essential to distinguish between these processes and those operating under the present conditions.

The intensity of soil weathering as indicated by the depth of the weathered horizons which has occurred on some sites in the Glackmeyer Development Area is an example of this. On these sites the combined depth of A and B horizons is approximately 3 feet. Such intensive weathering could not have resulted from the interaction of the present forest types under the present climate on the soil materials. This deep podsolic weathering must have occurred during the xerothermic period when white and red pine forest types undoubtedly grew on these sites. A shallower podsol profile (about 15" in depth) has subsequently been superimposed upon the deeper profile owing to the interaction of the presently occurring combinations of spruce-intolerant hardwood forest types and a cool humid climate.

Turning to present trends, all the clay soils of the Glackmeyer Development Area may ultimately deteriorate to a peat glei soil if a black spruce

forest type becomes established and is maintained. The soil types, therefore, form a continuum at the upper limit of which is the grey-wooded soil with decomposing humus and at the lower limit of which is the deep peat soil with an accumulation of over 4 feet of raw acid peat. In terms of agricultural and forest use capability, this continuum ranges from the best sites for agricultural and forest crop production to sites which cannot be exploited for either of these crops. On the other hand, the processes of clearing and clutivation reduce the depth of peat, bring about an incorporation of the organic and mineral soil layers and a breaking-up of the clay-pan glei. Such changes are considered in distinguishing cultivated phases of a soil type. Several phases may be established depending upon the degree of improvement in soil drainage and nutrient availability which such practices establish.

It is possible that, in time, these changes which are recognized as phases may become of such magnitude that the modified type no longer belongs morphologically to the same great soil group and hence, strictly speaking, is not the same soil type. However, as mentioned elsewhere, (page 140), before recognizing a different soil type care must be exercised to insure that the soil profile has been completely changed and that the new features will be maintained during a pedologic period. Furthermore, the changing of the soil type name does not direct the attention of the land manager to the genesis which transforms one soil type to another in the same way that the designation of 'natural and cultivated phases' does. Knowledge of soil processes is incommensurably more important in land-use planning than taxonomic exactitude. The land manager, whether he is a farmer or a silviculturist, wants to know how to establish the most satisfactory soil conditions on a given area and how to maintain these conditions once they are established. Soil taxonomy alone cannot accomplish this in the Cochrane Clay Belt. In addition to soil profile type, it is essential to know details of (i) relief, (ii) history of natural vegetation, and (iii) type and degree of the disturbance to forest and soil profiles by fire, clearing, cultivation, etc.

Since the potential of a site at a given location could change from the highest to the lowest rating for crop production, it is important to consider factors of site deterioration and of site amelioration even though the rate of deterioration is so slow as to be almost imperceptible within the lifetime of an individual and the cost of amelioration is too costly for individual effort. Changes in soil profiles are, nevertheless, important from a long-term viewpoint. For example, it has been mentioned above that under cultivation a peat glei soil becomes transformed to a type of dark grey gleisolic. This is a reversal of a trend, under certain natural conditions, to deep peat formation, and although not always economic for the farmer, has far-reaching, long-term benefits for the country as a whole. Therefore, the fact that peat removal and the breaking of clay-pan is not an economic undertaking for the individual, should not be the deciding factor in planning land use on the provincial scale.

E. The Detailed Description of Soil Types and Soil Phases in the Glackmeyer Development Area.

(1) Grey-Wooded Profiles Developed in Cochrane Clay Materials Without Superimposed Podsol Profile

Phase (a) -- Decomposing Humus Phase

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | --- Decomposing humus. |
| $A_1$ | --- Thin horizon of light brownish to grey clay. |
| $A_2$ | --- Ashy grey clay, coarse platy structure. |
| $B_2$ | --- Blocky structured, chocolate brown clay or silty clay. |
| $C_1$ | --- High lime clay. |

This profile is found on fresh sites of the 2 moisture regime class. The texture of the $A_2$ is usually heavier than in the type with the superimposed profile.

Phase (b) -- Accumulating Humus Phase

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | --- Raw humus accumulation up to 3 inches thick. |
| $A_2$ | --- Ashy grey clay, coarse platy structure. |
| $B_2$ | --- Blocky structured, chocolate brown clay or silty clay. |
| $C_1$ | --- High lime clay. |

This soil type occurs on fresh sites of a 2 moisture regime class. The cover type associated with this soil type is either a pure black spruce stand or a mixed stand in which black spruce is a component.

This soil type will deteriorate rather rapidly to an incipiently gleid grey-wooded soil in the later stages of this accumulating humus phase.

(2) Podsol Profiles Superimposed in Grey-Wooded Profiles Developed in Cochrane Clay Materials

Profile Description

| Name | | | Description of Horizon |
|---|---|---|---|
| Podsol | | G. Wood | |
| A0 | | | -- Decomposing humus commonly occurs. |
| $A_2$ | in | $A_2$ | -- Ashy grey, excessive leaching of iron and aluminum. |
| $B_2$ | in | $A_2$ | -- Brownish coloration, otherwise similar to $A_2$ below. |
| $B_3$ | in | $A_2$ | -- Creamy grey clay loam or silt loam. |
| | | $B_2$ | -- Blocky structured, chocolate brown clay or silty clay. |
| | | $C_1$ | -- High lime clay. |

Grey-wooded soils on Cochrane clay materials having superimposed podsol profiles, occur on fresh sites of the 2 moisture regime class. They are commonly found on the Cochrane kame landtype and somewhat less frequently on the fresh sites of the Cochrane drumlin, stream-dissected and troughed plain landtypes. They occur generally where there is a mantle of loamy superglacial till. A mixed cover type of white spruce, balsam fir, poplar and white birch usually constitute the climax stands on these soils. Herbs rather than mosses dominate subordinate vegetation. The humus, though it does decompose, mixes only slightly with the underlying mineral soil and consequently does not form a melanized horizon.

(3) Incipiently Gleid Grey-Wooded Profiles Developed in Cochrane Clay Materials

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | -- 3" to 6" of accumulating humus. |
| $A_1$ | -- Ashy grey clay, platy structure. |
| $A_2G_2$ | -- Coarsely platy grey clay, slightly mottled. |
| $B_2G_2$ | -- Coarsely blocky brownish clay, slightly mottled. |
| $B_2$ | -- Blocky structured, chocolate brown clay. |
| $C_1$ | -- High lime clay. |

This soil type occurs on sites of the 3 moisture regime class. The cover types associated with this soil type are similar to those associated with the grey-wooded soils with accumulating humus. The conditions which are responsible for the formation of the glei of this soil type has been discussed in the foregoing section. As indicated in the profile description, the structure of the portion of the $A_2$ and $B_2$ horizons where gleization occurred is but slightly changed. Similarly, the appearance of these horizons is slightly altered by a blue-grey or rusty mottling. The $A_2$ horizon is noticeably lighter in colour and the $B_2$ darker in colour than the slightly weathered $C_1$ horizon.

(4) Grey-Wooded Glei Developed in Cochrane Clay Materials
Phase (a) Decomposing Humus Phase
Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | -- Decomposing humus. |
| $A_1$ | -- A dark grey to brown clay horizon with brown mottling or blue-grey mask. |
| $A_2G_2$ | -- A somewhat platy structured light grey clay horizon with ~~brown mottling or blue-grey mask.~~ incorporated organic matter |
| $B_2G_2$ | -- A dark brown clay transition from small blocks to more massive blocks mottled or blue-grey mask. |
| $B_2$ | -- Blocky structured, chocolate brown clay. |
| $C_1$ | -- High lime clay. |

This soil type occurs on sites of the 4 moisture regime class, commonly occurring at the foot of slopes of the kame and drumlin landforms. Carbonates and other plant nutrients are supplied to these sites by telluric water which flows down from the upper slopes. Hence the level of available plant nutrients is often higher on these sites than that of 2 and 3 moisture regime sites. There is also a more rapid decomposition of organic matter on this soil type. A definite A1 horizon is formed by the mixing of decayed organic matter with the mineral soil. The structure of this melanized horizon varies from a shot-clay structure to a small crumb structure. The gleization of the horizons is similar to that of the incipiently gleid grey-wooded profile but has proceeded further because of the moisture regime. This soil type is associated with a mixed conifer and deciduous forest cover type and a subordinate vegetation characterized by a mixture of herbs and mosses with the herbs dominant.

Phase (b) Accumulating Humus Phase

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | -- 5'' to 8'' accumulating humus. |
| $A_2$ | -- Grey wooded $A_2$. |
| $A_2G_2$ | -- Transition $A_2$ to glei. |
| $B_2G_2$ | -- Transition $B_2$ to glei. |
| $B_2$ | -- Blocky structured grey-wooded $B_2$. |
| $C_1$ | -- High lime clay. |

This soil type also occurs on the 4 moisture regime site classes, commonly with stagnant water. The organic horizon is composed of an accumulation of poorly decomposed humus, and there is no melanized horizon. Vestiges of the structure and appearance of the $A_2$ and $B_2$ horizons are still discernible in the gleid horizons though the general structure is massively blocky, the blocks being frequently coated with a film of colloidal clay. The forest type associated with this soil type is similar to that on the grey-wooded glei with decomposing humus, though the moss vegetation is usually more abundant in this soil type.

(5) Dark Grey Gleisolic Profiles Developed in Cochrane Clay Materials

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | -- Humus layer very thin if present. |
| $A_1$ | -- ½'' to 3'' of very dark brown silty clay loam, fine granular structure, very friable. |
| $G_1$ | -- 8'' to 12'' greyish brown clay, strongly mottled with brown coarse blocky structure. |
| $C_1$ | -- High lime clay. |

True dark grey gleisolic soils are found but sparingly in the Glackmeyer Development Area usually on telluric slopes on the edge of peat areas.

Pseudo-dark grey gleisolic soils may be developed through burning and cultivation of peat glei soils. Generally the massive, structureless $G_2$ is not completely broken up. The profile is more correctly described as dark grey gleisolic profile superimposed on a peat glei. The following is but one of the variations to be found in such 'transition' profiles.

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_1$ | -- (Cultivated layer) 6'' to 8'' very dark brown clay, granular structure, very friable. |
| $G_1$ | -- 0'' to 3'' greyish brown clay, coarse blocky. |
| $G_2$ | -- 2'' to 6'' blue-grey clay with slight or no mottling, massive structureless clay. |
| $C_1$ | -- High lime clay. |

See pages 140 and 142 - 143. for further discussion of these man-made dark grey gleisolic soils.

(6) Grey-Wooded Peaty Glei Profile Developed in Cochrane Clay Materials

Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0$ | -- 6'' to 12'' peat, generally slightly decomposed, except in lower portions, which are fairly well decomposed. |
| A2G2 | -- Massive blocks often masked with blue gleis. |
| $G_2B_2$ | -- Dominantly massive clay, but with local dark-brown blocks. |
| $C_1$ | -- High lime clay. |

This soil type occurs on sites of the 5 moisture regime class. The dominant characteristic of the glei horizon is its massive structure. However, there is sufficient crumb structure material in this horizon to indicate it was formed in a former grey-wooded $B_2$ horizon. A pure black spruce stand with moss subordinate vegetation is usually associated with this soil type.

(7) Peat-Glei Profile and Shallow Peat Profile Developed in Jessop Peat over Cochrane Clay, also Peat Profile Developed in Jessop Peat.

Generalized Profile Description

| Name | Description of Horizon |
|---|---|
| $A_0 1$ | -- Over 12'' of poorly decomposed peat. |
| $A_0 2$ | -- Trace to 8'' of partially decomposed peat. |
| $G_2$ | -- Massive blue-grey clay-pan glei. |
| $C_1$ | -- High lime clay. |

This group of organic soil types is developed on sites with moisture regimes ranging from very moist to saturated. The difference between the sites of the group is largely a difference in the amount of peat accumulation and the depth of glei. The glei horizon is completely massive in structure and bluish-grey in colour so that there is no evidence in the glei horizon to suggest that the glei has formed in a former $B_2$ horizon. However, even on the wettest sites a partially to well decomposed humus layer is found on local areas just above the mineral soil horizons. This decomposition must have occurred when the sites were much drier than at present. Observation of the full range of variations of soil type development on all sites in the Glackmeyer Development Area indicates a continuum of soil types. This is further evidence that the $G_2$ horizon of the peat-glei soil has developed in a former $B_2$ horizon.

F. The Distribution Pattern of Soil Types and Phases on the Commonly Occurring Physiographic Sites.

In Research Supplement II, landtypes are described as areas having a commonly occurring pattern of physiographic sites. Likewise, landtypes are areas having a commonly occurring pattern of soil profiles. This is illustrated in diagrams 4 - 9 inclusive.

These diagrams present a generalized cross section of the parent soil materials and relief. The soil profiles representative of the great soil group which commonly occurs on each material is indicated.

If the texture, geological fabric and chemical composition of the Cochrane Clay parent materials did not vary beyond the limits of a soil type as defined by soil taxonomists, each combination of Great Soil Group profile and Cochrane Clay parent material would constitute a soil type. However, clay, silty clay and silty clay loam are common textures. Three fabrics types of till occur. Although high lime material is dominant, very local areas of very high lime

clay occur. These are sufficient differences to warrant the establishment of at least five catenas which means that there are five soil types (rather than one) possible for each great soil group profile on Cochrane Clay materials. Although it is possible to recognize these five material types in the field, it is impossible to map them on a practical scale. Accordingly, the variations of the Cochrane clay materials are recognized for each landform variation within the landtype and the commonly occurring variations as shown in the diagrams.

These diagrams indicate the 10 or more combinations of great soil group profile and parent soil materials that may, and frequently do, occur within a ten acre field.

(1) Soil Types Commonly Occurring on the Cochrane Kame Landtype.

Diagram 4 presents the distribution pattern of commonly occurring soil profiles on this landtype. Brown-wooded profiles on eroded slopes, podsols developed in grey-wooded profiles on the well-drained portions of the more permeable materials, and dark grey gleisolic soils on telluric slopes are some of the outstanding characteristics of this soil profile pattern.

(2) Soil Types Commonly Occurring on the Cochrane Drumlin Landtype.

Diagram 5 presents the distribution pattern of commonly occurring soil profiles on this landtype.

(3) Soil Types Commonly Occurring on the Stream-dissected Plain Landtype.

Diagram 6 presents the distribution pattern of commonly occurring soil profiles on this landtype.

(4) Soil Types Commonly Occurring on the Cochrane Troughed Plains Landtype.

Diagram 7 presents the distribution pattern of the commonly occurring soil profiles on this landtype.

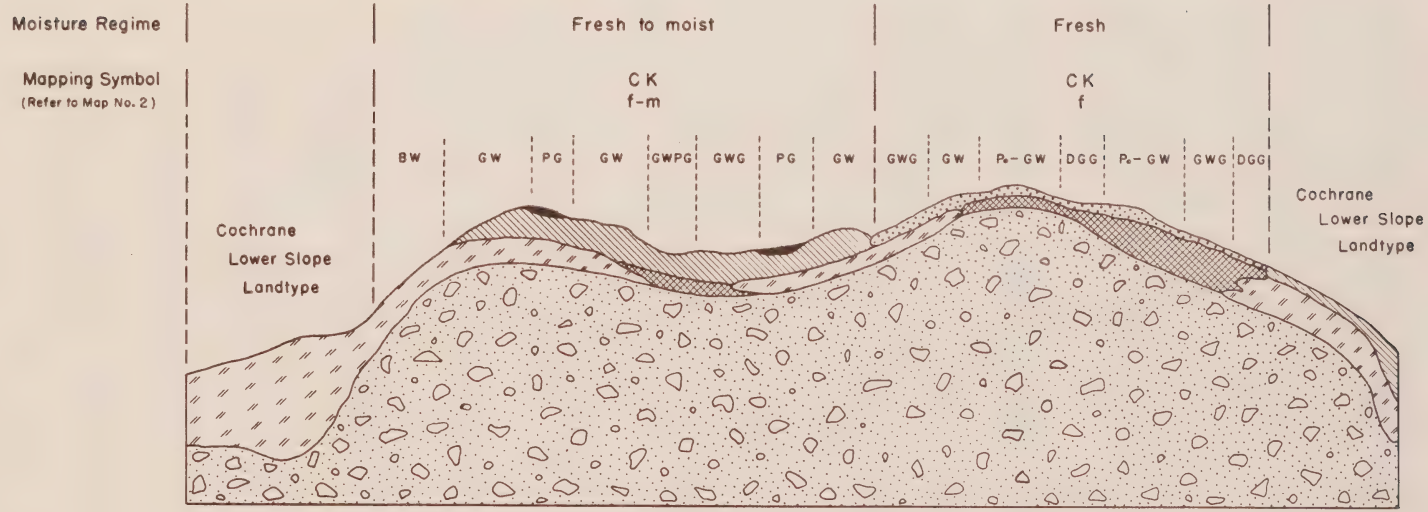
(5) Soil Types Commonly Occurring on the Cochrane Channel Landtype.

Diagram 8 presents the distribution pattern of the commonly occurring soil profiles on this landtype.

(6) Soil Types Commonly on the Cochrane Lower Slope and Jessop Landtypes.

Diagram 9 presents the distribution pattern of the commonly occurring soil profiles on these landtypes.

# DISTRIBUTION OF SOIL TYPES* ON THE COCHRANE KAME LANDTYPE




## GREAT SOIL GROUP PROFILE

BW — Brown Wooded.
GW — Grey Wooded.
$P_o$ - GW — Podsol in Grey Wooded.
GWG — Grey Wooded Glei.
DGG — Dark Grey Gleisolic.
GWPG — Grey Wooded Peat Glei.
PG — Peat Glei.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.
Mod. Permeable Basal Clay Loam and Loam Till.
Somewhat Permeable Ablation Silty Grey Till.
Permeable Clay Loam, Silt Loam and Loam Till.

## OTHER MATERIALS

Overlying Peat.
Underlying Glacifluvial Sand and Gravel.

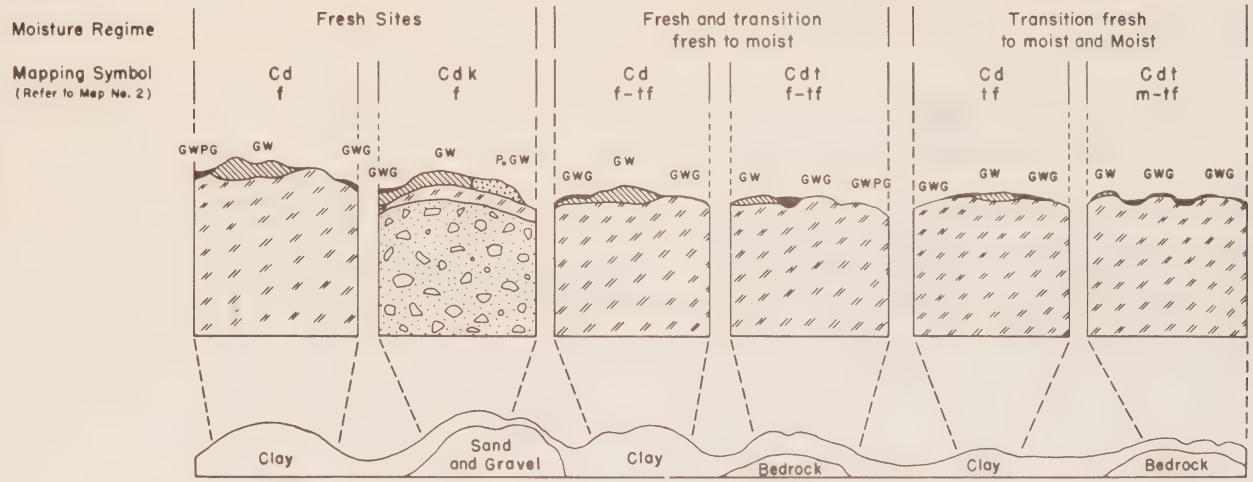
*Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

Diagram — 4

SITE SECTION
DIVISION OF RESEARCH
DEPARTMENT OF LANDS AND FORESTS
JULY — 1956

# DISTRIBUTION OF SOIL TYPES* ON THE COCHRANE DRUMLIN LANDTYPE

( Including combinations with Kames and troughed plain landtypes )




## GREAT SOIL GROUP PROFILE

GW — Grey Wooded.

$P_o$GW — Podsol in Grey Wooded.

GWG — Grey Wooded, Glei.

GWPG — Grey Wooded Peat Glei.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.

Somewhat Permeable Ablation Silty Clay Till.

Permeable Clay Loam, Silt Loam and Loam Till.

## OTHER MATERIALS

Overlying Peat.

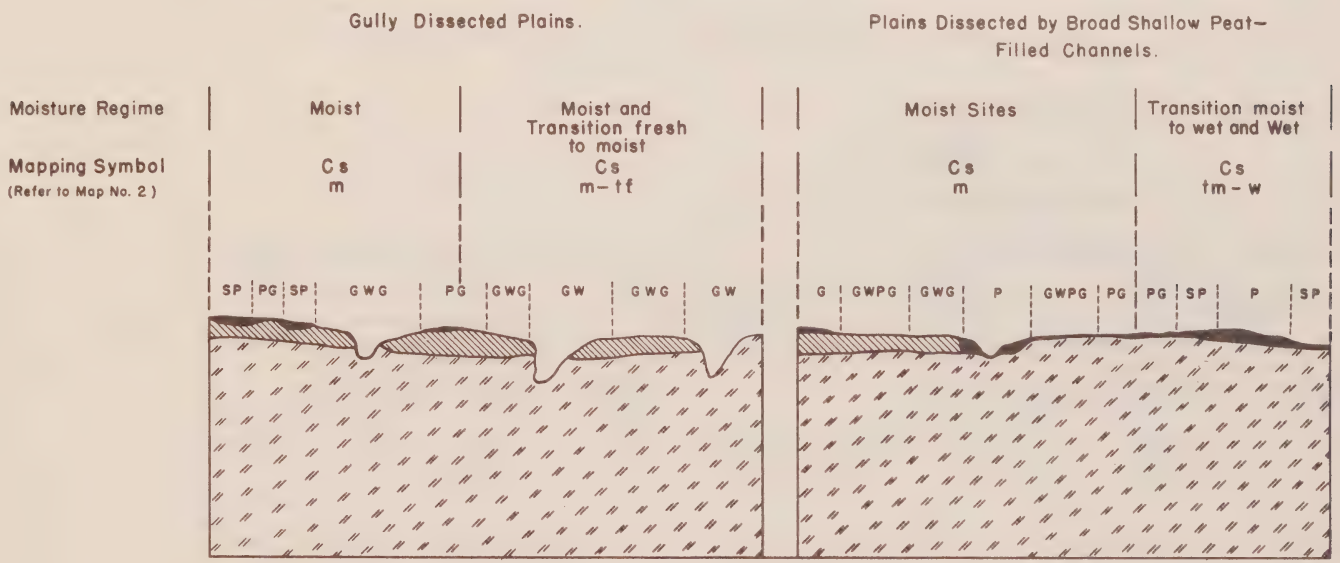
Underlying Glacifluvial Sand and Gravel.

* Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

Diagram — 5

SITE SECTION
DIVISION OF RESEARCH
DEPARTMENT OF LANDS AND FORESTS
JULY - 1958

# DISTRIBUTION OF SOIL TYPES* ON COCHRANE STREAM DISSECTED PLAIN LANDTYPE




## GREAT SOIL GROUP PROFILE

GW — Grey Wooded.
GWG — Grey Wooded Glei.
GWPG — Grey Wooded Peat Glei.
PG — Peat Glei.
SP — Shallow Peat.
P — Deep Peat.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.
Somewhat Permeable Ablation Silty Grey Till.

## OTHER MATERIALS

Overlying Peat.

*Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

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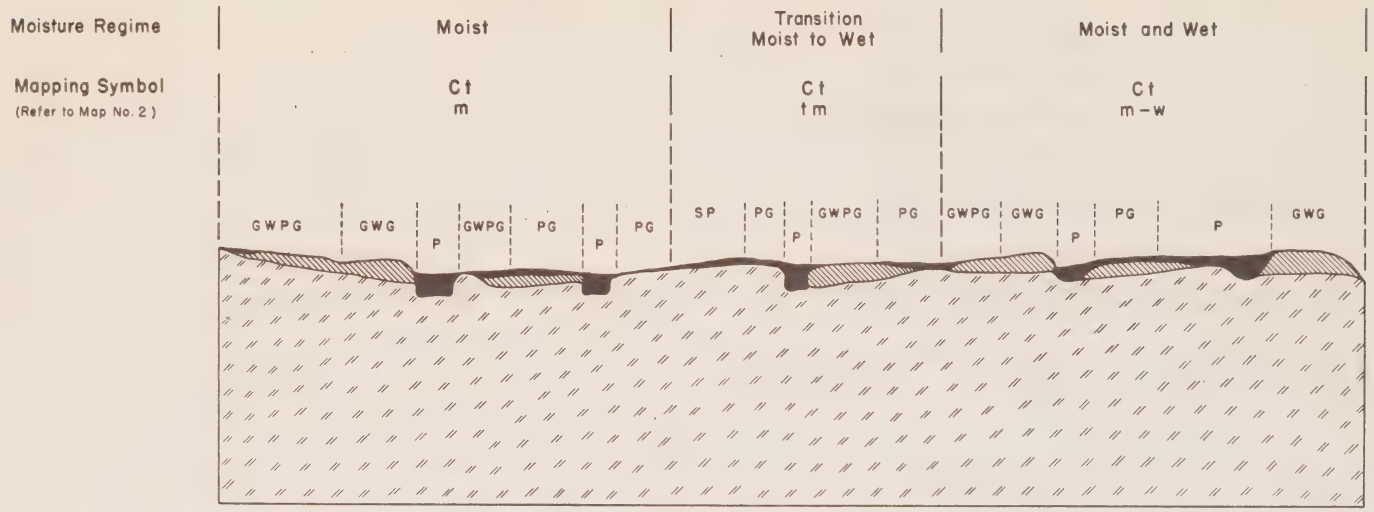
# DISTRIBUTION OF SOIL TYPES* ON THE COCHRANE TROUGHED PLAIN LANDTYPE




## GREAT SOIL GROUP PROFILE

GWG — Grey Wooded Glei.
GWPG — Grey Wooded Peat Glei.
PG — Peat Glei.
SP — Shallow Peat.
P — Deep Peat.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.

Somewhat Permeable Ablation Silty Grey Till.

## OTHER MATERIALS

Acid Jessop Peat.

*Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

Diagram — 7

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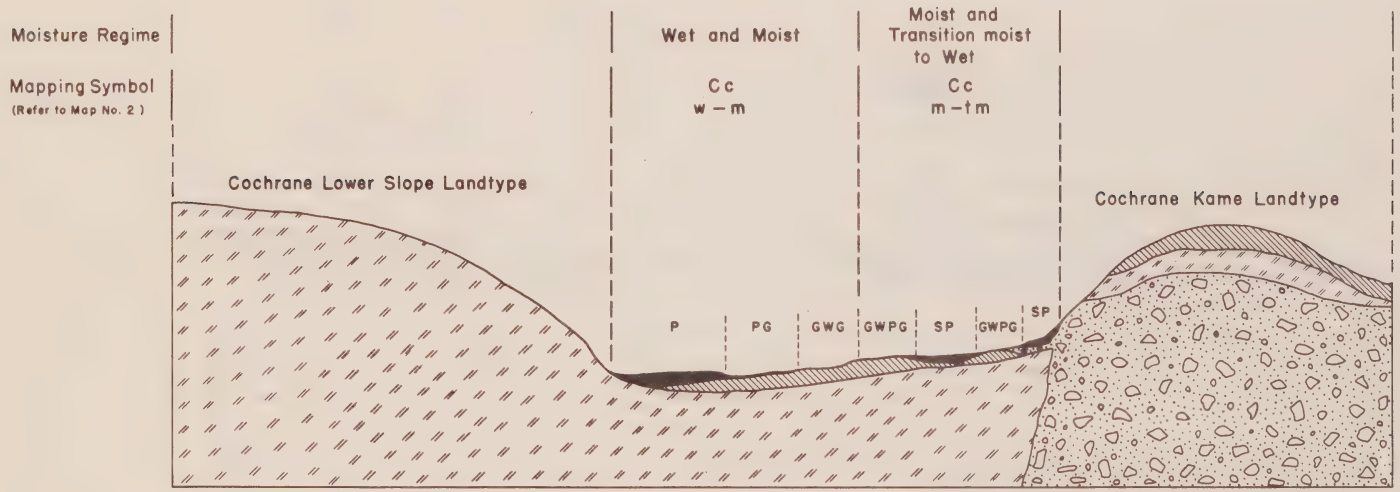
JULY-1958

# DISTRIBUTION OF SOIL TYPES* ON THE COCHRANE CHANNEL LANDTYPE




## GREAT SOIL GROUP PROFILE

GWG — Grey Wooded Glei.
GWPG — Grey Wooded Peat Glei.
PG — Peat Glei.
SP — Shallow Peat.
P — Deep Peat.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.
Somewhat Permeable Ablation Silty Grey Till.

## OTHER MATERIALS

Acid Jessop Peat.
Sand and Gravel.

*Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

Diagram – 8

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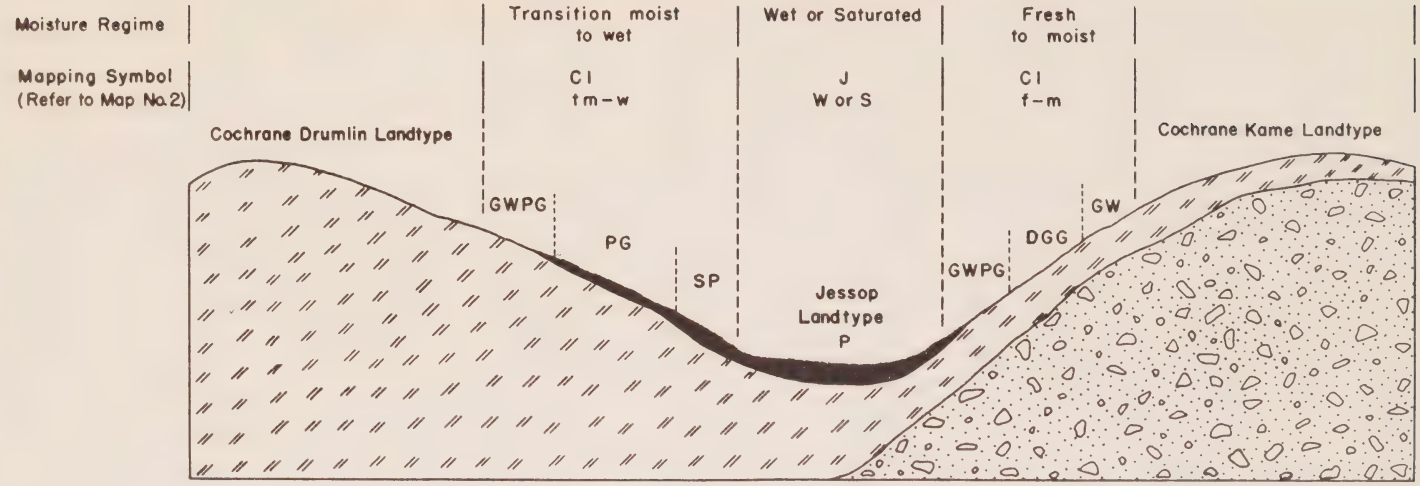
JULY – 1956

# DISTRIBUTION OF SOIL TYPES* ON THE COCHRANE LOWER SLOPE AND JESSOP LANDTYPES




## GREAT SOIL GROUP PROFILE

GW — Grey Wooded.
GWPG — Grey Wooded Peat Glei.
DGG — Dark Grey Gleisolic.
PG — Peat Glei.
SP — Shallow Peat.
P — Deep Peat.

## VARIATIONS IN COCHRANE CLAY MATERIALS

Impermeable Basal Clay Till.

## OTHER MATERIALS

Overlying Peat.

Underlying Glacifluvial Sand and Gravel.

* Any Great Soil Group profile developed in Cochrane Clay Materials designates one or more soil types depending upon the definitive characteristics established for the soil types.

SITE SECTION
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Diagram — 9

# PRINCIPLES AND METHODS REQUIRED FOR PLANNING THE AGRICULTURAL USE OF LAND IN THE GLACKMEYER DEVELOPMENT AREA

## A. An Agricultural Land-Use Inventory for the Cochrane Clay Belt

In order to plan for the future agricultural development of the Cochrane Clay Belt, it is essential to know not only what crops to grow but, also, on what type of land to grow them and what management practices produce the most favourable returns. An inventory of 'present land use' provides an evaluation of present farm management practices in terms of differences of the natural land qualities combined with differences in past cultural practices.

The objectives for making such an inventory are:-

(i) To provide a basis for the comparative rating of the agricultural capability of the commonly occurring physiographic sites.

(ii) To rate the desirability of any particular land use - (a) economically, (b) socially.

(iii) To recommend future land use practices for the same and comparative areas.

Land-use inventory is thus a compilation of observations derived from a number of unplanned experiments which should be described in terms of (i) the land, (ii) the crops, (iii) the management practices, (iv) the yields in terms of quantity and quality (input-output ratio if possible), (v) public welfare.

Present land-use ratings may be presented in general or specific terms for both crops and management practices. Initially specific values are considered; later generalized ratings can be made from these specific values. The initial consideration would include the quantity and quality of each species (in some cases each variety) of crop which has been produced on specific physiographic conditions using specific farm management practices in an environment where the prevailing economic conditions, such as markets, farm operating costs, etc. are known.

The following illustrates the necessity to consider past and present uses of land units as complexes of crops and physiographic sites in relation to management practices within a specific social-economic milieu. A certain

management practice as indicated by certain levels of development, maintenance and operational costs may produce yields of farm crops which are satisfactory on one physiographic site but, on another, the yield may be far from satisfactory.

For example, the fresh sites of the Cochrane clay-capped kame landtypes are characterized by a decomposing humus, a slight degree of melanization and an internal drainage which is better-than-average for fresh clay sites for the site region. The combined effect of climate and vegetation has produced a surface soil of low fertility. Management practices must be directed toward the building-up of a good surface soil with both mineral fertilizers and organic amendments. These practices will increase the fertility of the surface soil indirectly by improving the structure of the surface soil and providing a more suitable environment for the air-loving soil micro-organisms and other agencies involved in the processes of decomposition of organic matter and its incorporation with the clay. They also increase the fertility directly by increasing the supply of available plant nutrients.

Better-than-average drainage facilitates the ameliorating processes of humus breakdown and release of nutrients, but it also makes necessary sustained treatment since both humus and nutrients disappear from the soil rapidly. However, if the right type of crop is grown to take advantage of the nutrient turnover, the practice may be much more economical than the development of more poorly drained soils where humus decomposition and nutrient leaching are slower, but where there is less biological activity and hence poorer growth and lower yields.

The latter conditions are more prevalent on the fresh sites of the drumlinized Cochrane clay landtype where soils with an accumulating humus are found. Superficially these soils appear to be richer because of the accumulation of organic matter.

A similar comparison can be made between moist sites, the one with decomposing humus, the other with accumulating humus. Decomposing humus is found locally in naturally occurring dark grey gleisolic soils where it is becoming incorporated with the mineral culturally developed from peat-glei soils. The accumulating humus is found on grey-wooded peat glei soils. On these latter soils, waterlogging prevents the decomposition of the humus so that it persists as a partly decomposed, mossy and woody peat which is low in plant nutrients. This raw humus does not become incorporated with the underlying mineral soil. It acts as a sponge and seriously hinders any efforts to improve drainage. It also increases the frost hazard.

Difficulties in the removal of the peat surface, the breaking-up of the of the glei, draining and improving the aeration of these soils make their development costly.

It is obvious then that the practices which develop and maintain the productivity on the fresh sites of the Cochrane clay-capped kames are not the same as those which will be successful in handling the moist sites or even the fresh sites of the drumlinized Cochrane clay till.

An inventory of past and present land uses must be supplemented by experimental studies which will have the following objectives:-

(i) To provide a detailed basis for assessing the factors involved in past and present land use.

(ii) To provide, if possible, a complete scale of the factors of crop, physiographic site, management sociology and economics.

(iii) To provide an adequate scientific bases for the extension worker.

Very few experimental studies dealing with the aspects of agricultural science which shed light on the problem of assessing the agricultural capabilities of lands are applicable to the Glackmeyer Development Area. Furthermore, a synthesis of the findings of those studies which are applicable do not, in any measure attain the objectives outlined above. Consequently, further experimental studies should be undertaken without delay for the following reasons:-

(i) Considerable time would be required to complete the studies if they are to be sufficiently broad in scope and sufficiently detailed to attain the objective.

(ii) As stated elsewhere in this report (page 7) a real pressure for land in this study area and indeed throughout the Cochrane Clay Belt is probable in the future. To assure the success of this new development it is desirable to know in advance as much as possible about the agricultural use capabilities of these lands.

(iii) The findings of these studies could in large measure be of immediate practical value to the farmers of the area if applied as they become available.

Many economic studies of land use and farm management practices do not contribute to the solution of the problems outlined above because they fail

to describe the natural land qualities of the land. For example, A. Gosselin and G. P. Boucher in their publication "Settlement Problems in North-Western Quebec and North-Eastern Ontario" do not have a physical basis, such as the agricultural use capability classification, on which to determine success or failure. The contribution which the great amount of detailed data collected during their survey could make, if it were related to even the broadest type of physical land classification, would have been magnified many fold.

Likewise the experiments and demonstrations which have been carried on at the Experimental Farm at Kapuskasing and at illustration stations and demonstration farms elsewhere in the Clay Belt have not been used to describe regional types of land classified on differences in their potential for agricultural production.

At the present time various groups of federal and provincial workers are working on methods for establishing such programs. Committees are already at work to devise ways of using soil maps for this purpose.

In the present report, an inventory of the present use of agricultural land is presented at various levels in the Agricultural Land-Use Plan. The classification of the farm lots according to the degree to which they are well farmed is actually a present land-use classification. The discussion of present rural economy patterns deals with present use at a broader level.

The agricultural use capability classes (see next section) are a framework designed to guide settlement and a general way point to broad differences in soil and climate which determine differences in management practices.

## B. The Basis Used in Rating the Agricultural Use Capabilities of the Land

### (1) The Factors which Determine the Agricultural Potential of Land

The factors which determine the capability of land for agricultural development may be grouped into two classes - (i) those factors which determine the growth of plants, and (ii) those factors which facilitate the seeding, planting, cultivating and harvesting of the crops.

The features significant in the growth of plants are usually discussed under the headings of soil and climate. The soil features are mainly those which determine the supply of moisture and nutrients to the plants and which furnish support. The climatic features supply the plants with light, atmospheric moisture, heat, carbon dioxide and oxygen. The features which facilitate cultural operations are topography, stoniness, soil structure, drainage patterns and soil erodibility.

To a large degree soil alone can express agricultural use capability, since soils are developed by the action of climate upon those geological materials which are the parent materials of soils, such action being conditioned by drainage and vegetation. However, in order to use soil profiles in the evaluation of land for agricultural production, it is necessary to understand the degree to which topography modifies the effect of regional climate on soil profile development.

The following procedure was adopted in this study of agricultural use capability of lands for agricultural development:-

(i) Climatic regions were established, having similar soil and local climate conditions on similar landforms.

(ii) Variations in the relief and in the physical and chemical characteristics of the parent geologic materials which affect land use within each region are then determined.

It is evident that, in point of time, the research establishing each of these must be carried out together.

The simple scheme for distinguishing classes outlined in this section can be used with fair success in a technologic manner with little knowledge of soil profile and crop ecology. However, land is not well classified until full knowledge is employed of all the natural land qualities together with their ecological interrelationships and their significance in land management. Land is a complex of many characteristics, some of which vary dependently, others independently, according to the total complex of conditions with which they are associated. Therefore, the generalized picture of agricultural use capability, which is here presented, is but a framework into which the detailed problem may be placed, providing there is available considerable knowledge of land at the local and regional level.

(2) Regions Based on Effective Climate

The Province of Ontario has been divided into climatic zones of regions based on effective climate as reflected by the growth and distribution of plants in relation to local landform and soil conditions.

In each climatic region there is a comparatively wide variation in local climate due to differences in type of soil materials, lay of the land, natural vegetation, cultural treatments, etc. Conversely, regional climate cannot be evaluated independently of other natural qualities of the land. For example,

nowhere in Ontario will the climate, expressed in regional values, prohibit the production of such crops as may be required to carry on some type of general farming, providing that other conditions are optimum. For instance, in the Cochrane Clay Belt local climate will prevent the production of general farm crops on peat-covered flats which occupy a large proportion of the area. These same crops may be produced on the upland areas, even though local areas are peat-covered.

The climatic region must, therefore, be considered a pattern of local climates, some of which are favourable, others not so favourable to the production of a specific crop. The climatic region is a framework within which other factors such as soil materials and lay of the land must be studied in relation to local climate.

Climatic soil types develop through the action of climate and vegetation upon the geologic materials (the parent materials of soils). Accordingly, climatic regions are characterized by patterns of soil profiles related to differences in the relief and internal characteriatics of the geologic materials within the region.

(3) Subdivisions of Regions Based on Soil Materials

Each climatic region is subdivided into groups of geologic materials (parent soil materials), according to the qualities which make them suitable for farming, irrespective of climate and soil profile, that is, according to their arability. The Cochrane Clay Belt is a subdivision of a climatic region, Site Region 3 (see page 125), which includes most of the arable clay land of that climatic region.

(4) Interpretation of Soil Features in Terms of Requirements for Agricultural Production

In so far as possible, the qualities which have been considered are texture, drainage, permeability, soil nutrients, stoniness, shallowness over bedrock, erosion, slope, and peat accumulation. These qualities are examined to determine the expenditures in time, labour, and money necessary to bring the land into satisfactory agricultural production as well as to maintain them at this level.

This classification has been made dependent upon development as well as maintenance requirements because of the large areas of land in Ontario which are either undeveloped or underdeveloped for agriculture. In this respect this scheme differs from the agricultural use capability classes used in many parts of the United States and Canada which are based only on erosion control and maintenance of soil productivity. In summary, this classification is based upon (i) the cost of draining, of breaking and of improving the tilth

and fertility to a point where the land will produce satisfactorily, (ii) the cost of maintaining soil productivity, and (iii) the cost of controlling erosion.

The rating of productivity is comparative, that is, it reflects the ratio of output-over-input based upon the common crops grown in the region and the most suitable known methods. The best lands for general farm crops within each climatic region are rated Class A, and the poorest are rated Class G.

(a) Soil Drainage and Removal of Peat

Most clay soils require some improvement in the natural drainage. This must be largely brought about by surface drainage since soils of clay texture and massive structure seldom repay the cost of tile drainage if, indeed, tile drainage can be satisfactorily carried out.

If peat is present in depth greater than six inches, the problems of development are increased. The removal of peat in excess of six inches is essential and requires skill in drainage and firing if enough peat is to be left to mix with the poorly structured clay underlying the peat.

(b) Soil Structure and Aeration of Clay Soils

The structure of many clay soils is poor. Among the factors responsible for this poor structure, the following are the most important:-

(i) The high content of clay tends to make a massive structure, very plastic when wet, and brittle when dry. This is more pronounced when the soils are low in organic matter and lime.

(ii) The low lime content. Few of the heavy clays are initially very low in lime. In most soils there is plenty of lime in the parent material. On the better drained sites much of it has been leached from the surface owing to the acid type of humus formed under conifer, birch and aspen vegetation common to this climatic region.

(iii) A cool, moist climate and acid humus create conditions in Northern Ontario which are unfavourable for the bacteria and other micro-organisms essential to the adequate mixing of organic and mineral materials.

(iv) Where a layer of peat accumulates over poorly drained clay materials, a particularly massive clay layer develops in the mineral soil just below the peat. This layer, known as the glei (pronounce to rhyme with fly), is parti-

cularly impervious to water and root penetration until it is broken up and mixed with organic matter.

(c) Maintenance of Optimum Levels of Water and Plant Nutrients

Soil texture, to a large degree, controls the moisture relationships and the availability of both natural and applied plant nutrients within a soil.

Clay soils are, in the main, naturally high in potash but low in phosphorus. However, the poor structure so common in clay soils renders nutrients unavailable to plants, although they may be present in adequate amounts. Hence most clays require the application of phosphorus and organic manures, and in addition good tillage and management methods to render the potash, nitrogen and other elements available to the plant.

In maintaining optimum moisture relationships for plant growth, loams are the best. Clays have good moisture holding capacity where plants are concerned, only if the structure is good. Otherwise clay soils may be too wet in wet seasons and too dry in seasons of little rainfall. Clay soils may be "dry" to plants even though they contain considerable amounts of water.

Peat soils are not only low in mineral nutrients (phosphorus and potash) but are also low in available nitrogen.

(d) Removal of Stones

Grit and small stones may be beneficial in the improvement of fine textured soils. However, if the stones are large enough and sufficiently numerous to interfere with farm practices and to lower the moisture holding capacity of a soil below a desirable point, stony soils must be rated lower according to the degree of such handicaps.

(e) Erosion Control

Although many smooth areas in the north, such as the Cochrane Clay Plain, would be improved by stream erosion thereby increasing the run-off of surface water, any measures to lower the water-table and to encourage the surface water to flow in the smallest of ditches increases the danger of unwanted erosion. Evidence of undesirable erosion may be seen along deeply entrenched stream courses, such as the Abitibi River.

C. Detailed Description of Use Capability Classes

It has been stated above that the use capability classes have been established on a combination of requirements, namely those of the development and maintenance of soil productivity, and of the control of erosion.

The consideration of more than one group of criteria in a single classification presents certain difficulties. For example, qualities which will increase development costs are sometimes the qualities which decrease the cost of maintaining productivity and controlling erosion. In case of such confliction the requirements of development will take precedence over those of maintenance in this scheme. For instance, poorly drained peat-covered clays in the Cochrane Clay Belt, now placed in Classes C and D, largely on the basis of costs of development, may in a century or more have a higher capability than others now placed in A or B. For, once satisfactorily developed, the cost of maintaining productivity and controlling erosion may be quite low. However, it takes a long time to develop poorly drained land to the point where reduced costs of maintaining soil productivity outweighs the cost of draining and improving soil tilth. Therefore, for the present, this system of classification, based primarily on development, will be found to be most useful.

Since there are so many types of land, it would seem to be practically impossible to group them all into seven classes without placing together lands differing widely in their characteristics. However, it has been deemed necessary to do so for the purposes of land administration and for land-use planning in general. In the Glackmeyer Area where the soils are dominantly of one textural class, the classification is particularly useful.

It must be kept in mind that the following classification is for general farm crops, and that the ratings are most useful in planning for the development of a broad scale commercial type of agriculture. The application of these classes to multiple land-use planning will be discussed in a following section.

The ratings of low, moderate and high are relative within a climatic region and have no absolute significance. Low costs of development may be uneconomical in one region while moderate costs in another area may be well within the range of profitable investment.

(1) Agricultural Use Capability Class A

These are lands with very low development costs and low to moderately low maintenance costs. Representative soils of Class A are clay and loam of good structure and comparatively free from compact layers which limit root and water penetration. The natural drainage is good. There are few restrictions as to stoniness, erodibility, etc. Class A lands are not seriously broken by rock outcrops, swamps, muskegs, steep slopes and eroded areas. In brief, Class A lands are those which can be brought up to satisfactory agricultural production with the lowest costs and the simplest methods of any land within the region. This low cost is not necessarily economical.

Specifically, Class A lands require some, if not all, of the following practices before they will produce general farm crops on a level satisfactory for the region:-

(i) Minor improvements in drainage,
(ii) Moderately low improvements in soil fertility,
(iii) Simple erosion control methods.

(2) Agricultural Use Capability Class B

These are lands with low developmental costs and low to moderately low maintenance costs. The greater developmental costs compared with Class A is due to one or more of the following:-

(i) Greater drainage requirements,
(ii) An increase in stoniness,
(iii) Coarser and poorer soil,
(iv) Steeper slopes.

The following types of land are representative of Class B:-

(i) Clay and loam soils with imperfect natural drainage comparatively free from stones and compact layers and comparatively unbroken by rock outcrops, steep slopes, muskegs, etc.

(ii) Clay and loam soils with good natural drainage which are somewhat difficult to develop because one of the following features interfere to a moderately low degree:-

Stoniness
Compact layers
Rock outcrops
Steep slopes or other erosion features
Muskegs or other areas of difficult drainage.

Specifically, Class B lands require some, if not all, of the following practices before they will produce general farm crops on a level satisfactory for the region:-

(i) Moderately low improvement in drainage.
(ii) Moderately low to complex improvement in soil aeration and fertility.
(iii) Simple to moderately complex erosion control practices.
(iv) Removal of few stones as required.

(3) Agricultural Use Capability Class C

These are lands requiring moderately low expenditures for development and low to moderate expenditures for maintenance. For example, the fine textured soils of the Cochrane Clay Belt with six to eighteen inches of peat are included in this class.

The following types of land are representative of agricultural use capability Class C:-

(i) Clay and loam soils with imperfect natural drainage which are moderately difficult to develop because one of the following features interferes to a moderate degree:-

Stoniness
Compact layers
Rock outcrops
Steep slopes or other erosion features
Muskegs or other areas of difficult drainage.

Specifically, Class C lands require some, if not all, of the following practices before they will produce general farm crops on a satisfactory level:

(i) Moderately low drainage costs.

(ii) Moderately low methods in the improvement of soil structure, aeration and fertility in general.

(iii) Simple erosion control practices where necessary.

(iv) Low costs of removing stones.

(4) Agricultural Use Capability Class D

These are lands with moderate costs in both development and maintenance. The clay soils of the Cochrane Clay Belt with eighteen to thirty-six inches of peat are in this class. Other commonly occurring examples are:

(i) Clay and loam soils which are difficult to develop because one of the following features interferes to a moderately high degree:-

Stoniness
Compact layers
Rock outcrops
Steep slopes or other erosion features.

(ii) Imperfectly to poorly drained clays with a shallow covering of sand.

(iii) Clay soils comparatively shallow over bedrock.

Class D lands may be so rated also because of the distribution pattern of good and poor soils, for example, clay and loam areas broken by rock, sand spots or poorly drained areas.

Specifically, Class D lands require some, of the following practices before they can produce general farm crops on a satisfactory level:-

(i) Complex drainage operations including, in many cases, the removal of considerable depth of peat.

(ii) Complex soil improvement practices often of a physical nature such as breaking up compact subsoil.

(iii) Complex improvement in soil aeration and fertility.

(iv) Low to moderate erosion control practices.

(v) Moderate costs of removing stones.

(5) Agricultural Use Capability Class E

These are lands with moderately high costs of development and maintenance. In some cases it is the maintenance cost rather than development cost which places land in this category. A common example is a coarse textured soil. The cost of maintenance of these soils continues to be higher, although the cost of development may not exceed that of Class D. Included in Class E also are the organic soils deeper than three feet but reclamable with moderately high costs.

The following types of land are included in Agricultural Use Capability

(i) Coarse-textured soils with a smooth to gently rolling topography and with imperfect to excessive drainage and are comparatively free from stones and unbroken by rock outcrops, steep slopes, eroded areas and muskegs, etc.

(ii) Fine and intermediate textured soils, moderately stony and comparatively shallow over bedrock, having a smooth to gently rolling topography.

Specifically, Class E lands require some, if not all, of the following practices before they will produce farm crops on a level satisfactory for the region:-

(i) Heavy applications of mineral and organic fertilizers and of mineral and organic amendments (such as lime and peat).

(ii) Removal of stones in the fine textured soils.

(iii) Moderately complex erosion control methods.

(6) Agricultural Use Capability Class F

These are lands with high developmental and maintenance costs. They are the very shallow, the very stony, very steep and severely eroded lands.

Lands which are badly broken by bare bedrock, steep ridges or bogs are included in this class, even though the remainder of the land could be rated Class E and higher.

(7) Agricultural Use Capability Class G

These are lands with bare bedrock, open bogs and extremely broken lands on which the costs of development and maintenance are very high. These cannot be reclaimed except by very expensive engineering projects.

D. The Relationship of Agricultural Use to Other Uses of Land

Many interrelationships exist between the use of land for farm crops and for crops of forests and wildlife, (i) from area to area within the same period of time, (ii) from time to time on the same area.

For example, there are no absolute forest soils. In any given area, the poorest sites which barely support merchantable forest stands could be developed for agriculture if the following three conditions develop:-

(i) An active regional economy,

(ii) The evolution of relatively more efficient and inexpensive techniques of developing agricultural land,

(iii) A large and pressing demand for increased agricultural production.

Thus, for any area, other land uses cannot be planned until the probable trends in the growth of the agricultural communities of these areas have been estimated. Further, a static line cannot be drawn which will include all possible agricultural development and exclude all areas of permanent forest lands.

E. The Pressure for Lands for Agricultural Settlement

If we were to use the current demands for the agricultural lands of the Glackmeyer Development Area as a basis for predicting the growth of its agricultural community, we would forecast a very limited and spotty growth. It is necessary to analyze this current demand to ascertain the merits of this approach. The limited demand that does exist at present is due primarily to the fact that cheap land is available in the Glackmeyer Development Area. The purchase price of land, however, is but one factor to be considered when appraising the relative merits of establishing a farm in various localities. The costs of developing and maintaining the land for agricultural production, the crop yield, the probable climatic hazards, are other factors to be considered.

Because of the better climate, lands in Southern Ontario classified as agricultural use capability class C are roughly equivalent in their production to Class A lands in the Cochrane Clay Belt.

Thus the present demand for agricultural lands in the Development Area is a false demand based upon an erroneous belief that the cheap land available here can be developed at a lesser cost than the more expensive farm lands of Southern Ontario of comparative productivity. Another factor to be considered is that present regulations governing the sale of lands for agriculture, which pertain to the Development Area, permit the acquisition of a maximum of 75 acres of cheap Crown land (with the possibility of later acquiring a further 75 acres which may not necessarily be located contiguous to the original holding). Seventy-five acres is too small a holding to permit the efficient use of the equipment and implements which are required to develop and maintain lands in the Development Area; also the returns from the crop yield of 75 acres in this area are insufficient to offset production costs.

The fact that most of the homestead lots have less than 30 acres cleared does not indicate that this is all that is needed for a farm. It merely indicates that the settler is not farming nor can he hope to farm a 75 acre lot, except for a highly specialized type of agriculture for which there is only a limited need.

The demand for agricultural land in the Glackmeyer Development Area beyond that which supplies the regional markets will continue to be a false demand until (i) all lands in Southern Ontario of agricultural use capability classes A, B and C have been developed for agriculture or devoted to other

land uses, (ii) a type of agricultural activity has been developed in the Clay Belt which is able to compete with that of other areas.

The clearing and cropping of park lands in Britain during the last war is an example of a real pressure for agricultural lands. When such a demand occurs in Ontario, it will be possible to expand agricultural activities into the hinterland rather than to further develop the densely populated area. When such a real demand will arise and what the magnitude of that demand will be, can only be predicted within very broad limits of time and space. The population trend in Canada and the changes since 1940 in the rural economy pattern in Southern Ontario (for example, the lands withdrawn from agricultural production for housing and industrial development, and the increased efficiency of cultural practices on larger farm holdings) indicate that we may reasonably expect a real pressure for the agricultural lands of the Glackmeyer Development Area at some future date.

In addition to the foregoing factors, there is a psychological factor which may, at any time, add to the pressure for lands in the Development Area. The pioneer spirit is a deep-rooted human force; it is, in essence, a sincere desire to establish new communities in so far as possible by the individual and collective efforts of the settlers themselves with the hope that these communities will be an asset to the country as a whole and that they will in themselves provide an environment which will more closely approximate the settlers' idea of an ideal community. Past experience in the Development Area and elsewhere indicates that the pioneer spirit, when largely uninformed about natural land qualities and the difficulties imposed by the socio-economic environment of the area to be settled, can achieve but a meagre attainment of its aims. With increased general appreciation of this complex of natural and human factors, however, the pioneer spirit can operate as a positive creative force.

Accordingly, the present weak and ill-directed demand for agricultural lands in the Development Area is not sufficient evidence that there will be no real demand for these lands, providing:-

(i) Consolidation of farm communities and more efficient management of suitable farm units enables the local farmers to capture a greater proportion of the local market.

(ii) Increased production for consumption outside of the Clay Belt within the one-hundred year planning period is required and will be met.

## PRINCIPLES AND METHODS REQUIRED FOR PLANNING THE FORESTRY USE OF LAND IN THE GLACKMEYER DEVELOPMENT AREA

### A. The Definition of Forest Types

Forest types are devised to describe distinctive patterns of biotic sites. Biotic site includes the plant and animal life of the site which, together with the decomposing and decomposed organic matter, constitute the relatively unstable portion of the landscape. Although forest cover and shrub vegetation are the only features used to designate the forest types of the Glackmeyer Development Area on Map No. 6, these forest types were classified on the basis of characteristic patterns of forest cover, shrub vegetation, herbs and mosses, fauna, and organic soil horizons.

### B. The Relationship of Forest Succession to Physiographic Site in the Cochrane Clay Belt

Forest vegetation develops within a combined space-time continuum rather than within two separate continua of space and time. Consequently, to ascertain the position of a given forest type within the time continuum (succession), the space continuum of the physiographic features which determine major differences in succession trends must first be ascertained. This principle of forest succession is illustrated by Diagram 5 and the discussion which follows.

A commonly occurring cross-section of physiographic site patterns based on landform is shown in the diagram. The dominant site for each of these patterns is shown in the diagram and associated sites are outlined in the subsections (I to IV).

(i) Level plains of coarse sand and gravel.

Areas mapped as this physiographic pattern are dominantly composed of dry sites, but moist and wet sites also occur in areas where soil drainage within the rooting zone is impeded by underlying bedrock, boulder masses or silt strata.

(ii) Gently and moderately sloping areas of sand and gravel capped with Cochrane clay till.

Although areas mapped as this physiographic site pattern are dominantly composed of fresh sites, they also include transition fresh sites with an incipient glei horizon, because of the influence of forest type succession and climate of these areas, and moist and wet sites in small sags and pot-holes.

# AN EXAMPLE OF FOREST TYPE SUCCESSION WITHIN A CONTINUUM OF TIME AND SPACE

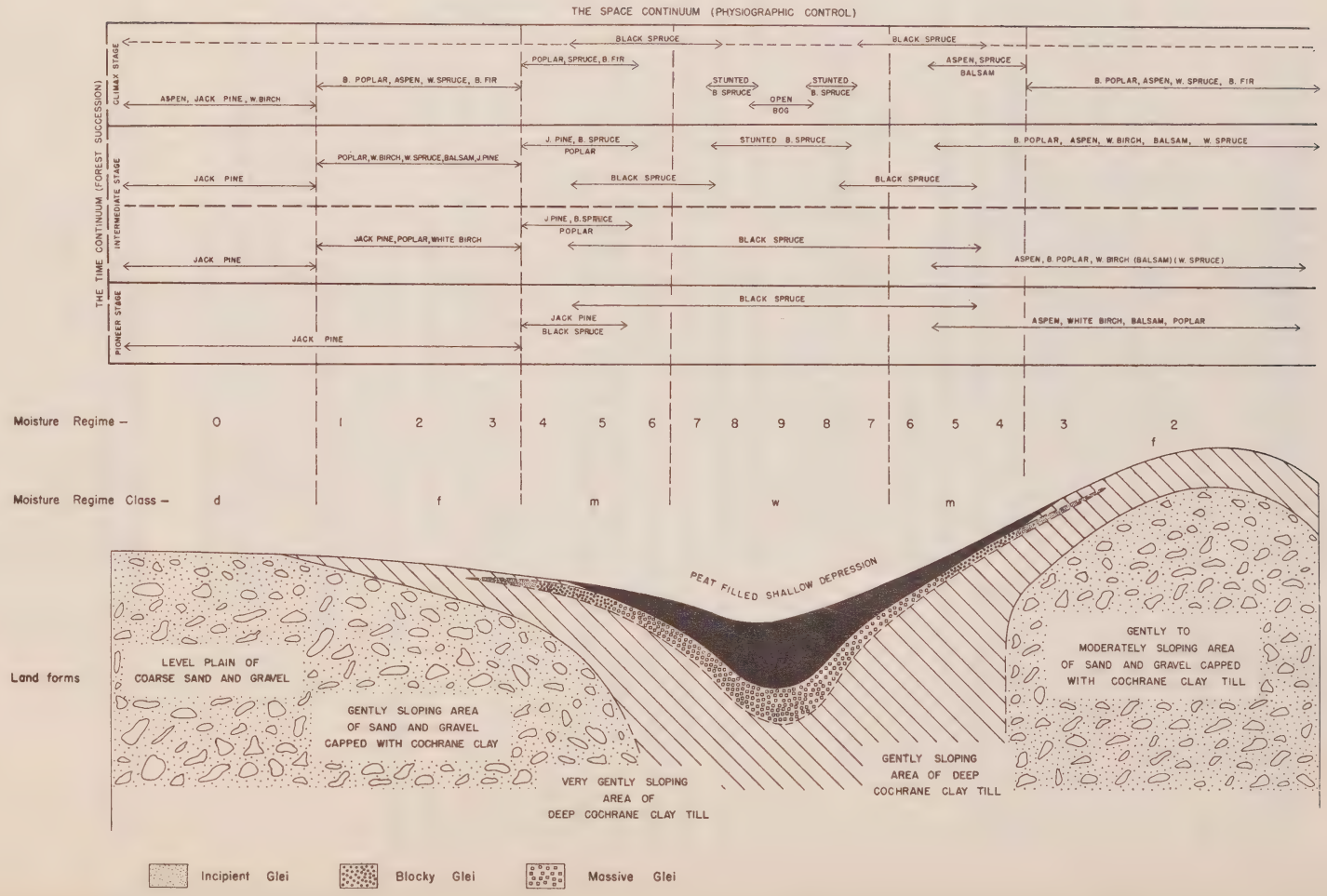



Diagram — 5

(iii) Very gently and gently sloping areas of deep Cochrane clay till.
A raw humus vegetation has moved up the slope from the adjoining depression and become established on most of this physiographic site pattern. Areas mapped as this physiographic pattern are dominantly composed of moist sites with stagnant soil water. They have a lower level of available nutrients than the moist sites where sand underlies the clay. In local areas which have steeper slopes, there may be a movement of telluric soil water which transports nutrients to the sites so that their level of available nutrients is comparable to the moist sites of the physiographic pattern in (ii) above.

(iv) A shallow depression filled with peat underlain by a deep, massive, impermeable glei horizon.
Areas mapped as this physiographic site pattern are dominantly composed of wet sites, though local areas of moist sites may be found on slightly elevated 'knolls'.

The pattern of forest succession commonly observed in the Glackmeyer Development Area is shown on the right side of the diagram and applies to all areas lying to the right of the central wet area. This succession pattern is common to all broad expanses of clay unbroken by sand plains, rock knobs or other landforms where jack pine is a component of the climax stand.

To illustrate the contrast in the succession pattern on areas where large amounts of jack pine seed are available, a sand plain is introduced on the extreme left of the diagram. On the left-hand side of the diagram are shown the succession patterns on clay areas which are influenced by the proximity of a large jack pine seed source, such as those occurring in the eastern and south-eastern part of the site region. It is assumed that the wet area in the centre is sufficiently wide to prevent the spread of jack pine seed from one side to the other.

(1) Succession on Areas Influenced by the Sand Plain

After a severe disturbance by fire, a uniform jack pine forest is established on the dry sites of the sand plain and on the fresh sites of the adjoining kame landform. A jack pine-black spruce forest is established on the 4 and 5 moisture regimes, and a black spruce forest is established on the remaining sites (moisture regimes 6 to 9) on the left side of Diagram 5. As the vegetation passes from one stage of development to another, physiographic differences are reflected in further variations in the vegetation. The jack pine forest which is originally established on a broad range of sites will persist and become the climax forest only on the very dry sites.

On the fresh sites, poplar and white birch will become established and later white spruce and balsam fir will invade these sites. Eventually a cli-

max poplar-white spruce-balsam fir forest type will become established on these fresh sites.

On the moist sites, the jack pine will gradually be replaced by poplar and birch and later by white spruce and balsam fir, at which time a climax forest is established. This is similar to the climax forest of the fresh sites, except that black spruce may be present as a minor component. When black spruce becomes established on these sites with blocky glei horizons and accumulating raw humus, this late climax stand is likely to change to a post-climax black spruce forest, unless it is disturbed by fire.

The black spruce forest originally established on the wet sites will persist as the climax forest on all clay areas, except those which are too wet to support a forest cover.

Site conditions will be sufficiently favourable on 6 and 7 moisture regimes for the development of merchantable black spruce pulpwood stands. If these sites are not disturbed by fire, raw humus will continue to accumulate and the glei horizon will continue to develop until they have deteriorated to an 8 moisture regime condition. Site conditions of the 8 moisture regime are such that only stunted non-commercial black spruce or larch stands can develop. The 9 moisture regime is for the most part too wet to support tree cover.

(2) Succession on Areas Remote from the Sand Plain

As indicated above, the pattern of forest succession on areas remote from the sand plain is that which occurs in the Glackmeyer Development Area. This succession pattern is discussed in the following section.

C. The Succession of Forest Types on the Glackmeyer Development Area

That variations in forest succession are controlled by patterns of physiographic site is demonstrated in the section above. Cover types have been established which represent stages in succession upon the various physiographic patterns. An outline of the ecological basis of this cover type classification is presented in the key to the map of Present Forest Cover (Map No. 6).

These interrelationships between patterns of physiographic site and forest succession in the Glackmeyer Development Area are outlined in greater detail in Table 24 and the discussion of this table which follows.

Table 24 is organized to emphasize the trends in succession on each of the commonly occurring physiographic sites of the Glackmeyer Development Area. There are many features common to the various physiographic site

patterns at a given stage of succession. Thus to facilitate the discussion of table 24 which is presented in the following sections, each section deals with a single succession stage and the conditions of all physiographic site patterns at that stage.

Table 24

TRENDS IN THE SUCCESSION OF THE FOREST TYPES OF THE GLACKMEYER DEVELOPMENT AREA

Titles of Subdivisions of Table 24



Notes applicable to all tables

(1) More details of the organic and A1 horizons are given in Research Supplement III.

(2) For abbreviations of tree species see Map No. 7.

Table 24 A

## FOREST SUCCESSION ON FRESH SITES

### 1. Moderately Permeable Clay and Loam, Moderate to High in Lime

| Stages * | Tree Cover | Humus Type | Melanization |
|---|---|---|---|
| **Climax** | | | |
| 9 Post climax | bPo,aPo,bF,wS,$\bar{b}$S | Thin, raw humus | Slight (A1 ½-1½ ins.) |
| 8 Climax | bPo,aPo,bF,wS | Decomposing humus | " " |
| **Intermediate** | | | |
| 6 Proceeding to climax | aPo,bPo,wB,bF,wS,bS | Thin decomposing humus | Slight (A1 ½-1½ ins.) |
| 5c Mod. disturb. climax | bPo,aPo,$\bar{b}$F | " " " | " " |
| 5a Arrested at intermed. | aPo,bPo,wB,$\bar{b}$F | Trace decomposing humus | No mixing |
| 4 Moderately restored | aPo,bPo,wB,bF,$\bar{w}$S | " " " | " " |
| **Pioneer** | | | |
| 3 Partly disturbed | aPo,bPo,wB | Trace decomposing humus | No mixing |
| 2 Completely disturbed | aPo,bPo,wB | Nil | |

### 2. Slowly Permeable Clay and Loam, Moderate to High in Lime

| | | | |
|---|---|---|---|
| **Climax** | | | |
| 9 Post climax | bPo,aPo,bF,bS,$\bar{b}$S,$\bar{b}$F | Thin, raw humus | Slight mixing |
| 8 Climax | bPo,aPo,bF,wS,$\bar{b}$F | Decomposing humus | " " |
| **Intermediate** | | | |
| 6 Proceeding to climax | aPo,bPo,wB,bF,wS,$\bar{b}$S | Thin decomposing humus | Slight mixing |
| 5c Mod. disturb. climax | bPo,aPo,bF | " " " | " " |
| 5a Arrested at intermed. | aPo,bPo,wB,$\bar{b}$F | Trace decomposing humus | No mixing |
| 4 Moderately restored | aPo,bPo,wB,bF | " " " | " " |
| **Pioneer** | | | |
| 3 Partly disturbed | aPo,wB | Trace decomposing humus | No mixing |
| 2 Completely disturbed | aPo,wB | Nil | |

*For definition of stages see G. A. Hills, Field Methods for Investigating Site" July 1955 pages 103 to 106.

Table 24 B

FOREST SUCCESSION ON MOIST SITES OF THE 4 AND 5 MOISTURE REGIME CLASSES

| Stages | Tree Cover | Humus Type | Melanization |
|---|---|---|---|
| Climax | | | |
| 9 Post climax | bS | Accum. raw humus 6"-12" | Moderate (A1, 1½"-4") |
| 8 Climax | aPo,bPo,bF,wS,bS | " " " 6"-12" | " " |
| Intermediate | | | |
| 6 Proceeding to climax | aPo,wB,bPo,BF,wS,bs | Accum. raw humus 6"-12" | Moderate (A1, 1½"-4") |
| 5c Mod. disturb. climax | aPo,bPo,bF | " " " 6" | " " |
| 5a Arrested at intermed. | aPo,wB,bF | " " " 6"-12" | " " |
| 4 Moderately restored | aPo,wB,bF,wS,bS | " " " 6"-12" | " " |
| Pioneer | | | |
| 3 Partly disturbed | aPo,wB | Accum. raw humus 6"-12" | Slight mixing |
| 2 Completely disturbed | aPo,wB | Nil | |

Table 24 C

## FOREST SUCCESSION ON TRANSITION MOIST AND WET SITES:

1. Moisture Regimes 6 and 7 (Telluric Water)

| Stages | Tree Cover | Humus Type | Melanization |
|---|---|---|---|
| Climax | | | |
| 9 Post climax | bS | Accumulating humus 1'-2' | No mixing |
| 8 Climax | bS | Decomposing humus 1'-2' | " " |
| Intermediate | | | |
| 6 Proceeding to climax | bS,wB,Cedar | Decomposing humus 1'-2' | No mixing |
| 4 Moderately restored | bS,wB,Cedar | " " 1'-2' | " " |
| Pioneer | | | |
| 3 Partly disturbed | bS,wB,Cedar | Decomposing humus 6"-1' | |

2. Moisture Regimes 6 and 7 (Stagnant Water)

| | | | |
|---|---|---|---|
| Climax | | | |
| 9 Post climax | open bS, L | Accumulating humus 2'-3' | No mixing |
| 8 Climax | bS,bS | " " 2'-3' | " " |
| Intermediate | | | |
| 5c Mod. disturbed climax | bS | Accumulating humus 2'-3' | No mixing |
| 4 Moderately restored | bS,aPo | " " 2'-3' | " " |
| Pioneer | | | |
| 3 Partly disturbed | bS,aPo,L | Accumulating humus 1'-2' | |

3. Moisture Regimes 8 and 9 (Stagnant Water)

| | | | |
|---|---|---|---|
| Climax | | | |
| 9 Post climax | L, stunted bS | Accum. humus over 3' | No mixing |
| 8 Climax | stunted bS | " " " 3' | " " |
| Pioneer | | | |
| 3 Partly disturbed | bS,L | Accum. humus over 2' | |

Table 24 D

SUBORDINATE VEGETATION ASSOCIATED WITH STAGES OF SUCCESSION ON FRESH SITES

1. Moderately Permeable Clay and Loam, Moderate to high in Lime

| Stages | Shrubs | Herbs | Mosses |
|---|---|---|---|
| | Mt. Maple, Hazel Mt. Ash | Aster, Aralia, Clintonia, Cornus, Streptopus | Lycopodium, Dicranum, Calliergon |
| Climax | | | |
| 9 Post climax | dense | vigorous | |
| 8 Climax | moderate | " | Lycopodium |
| Intermediate | | | |
| 6 Proceeding to climax | moderate | mod. vigorous | " |
| 5c Mod. disturbed climax | dense | " " | " |
| 5a Arrested at intermed. | moderate | " " | " |
| 4 Moderately restored | " | " " | " |
| Pioneer | | | |
| 3 Partly disturbed | Hazel, Willow | Aster, Cornus, Calamagrostis, Epilobium | Calliergon |
| 2 Completely disturbed | Nil | Equisetum | Cladonia |

2. Slowly Permeable Clay and Loam, Moderate to High in Lime (Continued)

Table 24 D (Continued)

SUBORDINATE VEGETATION ASSOCIATED WITH STAGES OF SUCCESSION ON FRESH SITES

2. Slowly Permeable Clay and Loam, Moderate to High in Lime

| Stages | Shrubs | Herbs | Mosses |
|---|---|---|---|
| | Mt. Maple, Mt. Ash | Aster, Aralia, Clintonia, Cornus | Lycopodium, Hypnum, Calliergon |
| Climax | | | |
| 9 Post climax | dense | vigorous | ,, |
| 8 Climax | moderate | ,, | ,, |
| Intermediate | | | |
| 6 Proceeding to climax | moderate | mod. vigorous | ,, |
| 5c Mod. disturbed climax | dense | ,, ,, | ,, |
| 5a Arrested at intermed. | moderate | ,, ,, | ,, |
| 4 Moderately restored | ,, | ,, ,, | ,, |
| Pioneer | | | |
| 3 Partly disturbed | Mt. Maple, Alder | Cornus, Calamagrostis, Epilobium | Calliergon |
| 2 Completely disturbed | Nil | Epilobium, Equisetum | Cladonia |

Table 24 E

SUBORDINATE VEGETATION ASSOCIATED WITH STAGES OF SUCCESSION
ON MOIST SITES OF THE 4 AND 5 MOISTURE REGIME CLASSES

| Stages | Shrubs | Herbs | Mosses |
|---|---|---|---|
| | Mt. Maple, Mt. Ash, Alder | Cornus, Linnaea, Coptis, Aster | Hypnum, Hylocomium Cushions of Sphagnum |
| Climax | | | |
| 9 Post climax | dense | vigorous | Hypnum, Hylocomium |
| 8 Climax | moderate | " | |
| | | Cornus, Linnaea, Coptis | Hypnum |
| Intermediate | | | |
| 6 Proceeding to climax | moderate | vigorous | " |
| 5c Mod. disturbed climax | dense | mod. vigorous | " |
| 5a Arrested at intermed. | moderate | " " | " |
| 4 Moderately restored | " | " " | " |
| Pioneer | | | |
| 3 Partly disturbed | dense | weak | Hypnum, Calliergon |
| 2 Completely disturbed | Nil | " | Calliergon |

Table 24 F

SUBORDINATE VEGETATION ASSOCIATED WITH STAGES OF SUCCESSION ON TRANSITION MOIST AND WET SITES

1. Moisture Regimes 6 and 7 (Telluric Water)

| Stages | Shrubs | Herbs | Mosses |
|---|---|---|---|
| | Alder, Cedar (Ground Hemlock on Climax) | Coptis, Linnaea, Gallium | Sphagnum, Hypnum |
| Climax | | | |
| 9 Post climax | dense | vigorous | " |
| 8 Climax | moderate | " | " |
| Intermediate | | | |
| 6 Proceeding to climax | moderate | vigorous | " |
| 4 Moderately restored | " | " | " |
| Pioneer | | | |
| 3 Partly disturbed | moderate | mod. vigorous | Hypnum |

2. Moisture Regimes 6 and 7 (Stagnant Water)

| | | | |
|---|---|---|---|
| | Alder, Labrador Tea | Linnaea (Cornus on Climax) | Sphagnum |
| Climax | | | |
| 9 Post climax | dense | vigorous | " |
| 8 Climax | moderate | " | " |
| Intermediate | | | |
| 5c Mod. disturbed climax | dense | mod. vigorous | " |
| 4 Moderately restored | low to moderate | " " | " |
| Pioneer | | | |
| 3 Partly disturbed | low to moderate | weak | Cladonia ~~Caladonia~~ |

(Continued)

Table 24 F (Continued)

## SUBORDINATE VEGETATION ASSOCIATED WITH STAGES OF SUCCESSION ON TRANSITION MOIST AND WET SITES

3. Moisture Regimes 8 and 9 (Stagnant Water)

| Stages | Shrubs | Herbs | Mosses |
|---|---|---|---|
| | Chamaedaphne | Eriophorum, Juncus & Carex | Sphagnum |
| Climax | | | |
| 9 Post climax | low | " | " |
| 8 Climax | " | " | " |
| Pioneer | | | |
| 3 Partly disturbed | " | " | " |

(1) The Pioneer Stage

(a) The Pioneer Stage on Fresh Sites

In table 24 A two seral substages are considered:-

(i) Where a severe fire completely removes the biotic features of the sites.

On these sites the organic horizon is completely consumed, the structure of the A1 horizon is substantially altered and the shrub vegetation is almost completely destroyed. A dense closed stand of aspen or white birch becomes established.

(ii) Where a less severe fire only partially removes the biotic features of the sites.

On these areas the organic horizon is only partially consumed, the A1 horizon is essentially unaltered and patches of shrub vegetation remain or quickly become established. On these areas a more open stand of aspen or white birch develops, in which white spruce and balsam fir occur as a minor component of this forest type.

The forest types at this stage are essentially similar on both moderately permeable and slowly permeable clay and loam parent soil materials. However, on sites which have been partially altered by fire, the shrub cover is usually more dense on the more permeable soil materials.

(b) The Pioneer Stage on Moist Sites

The trends of succession of the 4 and 5 moisture regimes are essentially similar on both the moderately permeable and the slowly permeable clay and and loam parent soil materials because the glei horizon has a more important influence than the parent materials upon the development of vegetation. Excessive soil moisture is retained in the upper soil horizons because the very slowly permeable glei horizon prevents the passage of soil water to the under lying, more permeable, soil horizons. In addition, the glei is almost impermeable to tree roots so that most of them are confined to the upper moist soil layers.

The pioneer forests on moist and fresh sites within the Glackmeyer Development Area are similar, although there is less shrub competition on moist sites which have been partially altered by fire. (See Table 24 B) The predominance of aspen and white birch on the moist sites of the Glackmeyer Development Area at the pioneer stage would appear to have resulted from successive fires or a combination of disturbance to the forest type by cutting

prior to disturbance of the sites by fire. In more remote parts of Site Region 3, where there was no cutting prior to the fire which established pioneer forest types, and where repeated fires on the same area rarely occur, the pioneer forests are dominantly spruce and balsam, aspen and white birch being a minor component. Moist sites within the Development Area which were cleared and pastured for some years without being cultivated and were later abandoned, have a pioneer forest with a higher stocking of spruce and balsam than similar sites which were cultivated or lay idle after clearing.

*Two photos comparing pioneer forest types on similar moist sites resulting from differences of cultural treatment. The stand in photo 13 (upper) was established on cultivated lands. Aspen, willow and alders are dominant so that the yield-quality production of this stand at maturity will be low. The stand in photo 14 (lower) was established on lands which were cleared and pastured, but not cultivated. Spruce, balsam and aspen share dominance so that the potential yield-quality production is high.*

(c) The Pioneer Stage on Wet Sites

These include the transition moist to wet sites as well as wet sites (see table 24 C.)

For the remaining sites of the Glackmeyer Development Area shown in Table 24 C, the accumulation of raw peat exceeds 1' in depth. Consequently, only very rarely does a severe fire consume all this peat accumulation. Hence, in the pioneer stage of these sites only one seral substage need be considered (substage 3 - biotic features partially removed). The pioneer forest types of sites of the 6 moisture regime with telluric water are dominantly black spruce with white birch and larch. Transition moist sites with stagnant ground water are dominantly black spruce with aspen and larch, the 8 and 9 moisture regime sites are exclusively black spruce and larch.

(2) The Intermediate Stage

(a) The Intermediate Stage on Fresh Sites

During the intermediate stage there is little difference in the character of the forest types of the fresh sites with moderately permeable or slowly permeable clay and loam. (See table 24 A). Semi-tolerant conifers gradually become established at this stage. Succession of sites on which the biotic features were completely removed by fire are likely to become arrested at the intermediate stage. The dense aspen or birch forest types which are established on these sites may remain essentially unaltered for the greater part of two forest rotations. In moderately disturbed climax communities (seral stage 5c on table), cutting or light fires tend to eliminate the conifers from the main story of these climax forests because the conifers are less resistant to fire than poplar and because cutting in these types is largely restricted to the conifers. The understory of these types is dominantly balsam because site conditions are such that balsam regenerates and becomes established more readily than spruce.

(b) The Intermediate Stage on Moist Sites

The forest types of the moist sites develop at the intermediate stage in the same manner as outlined above for the fresh sites. (See table 24 B). The decomposition of humus is more rapid on those moist sites which are enriched by nutrients carried in by telluric water than on fresh sites which are for the most part not enriched in this manner. An A1 horizon is also more highly developed on the telluric moist sites than on either the fresh sites or the stagnant moist sites. Particularly is this the case when the forest type associated with the telluric sites has a sizeable balsam poplar component.

(c) The Intermediate Stage on Wet Sites

These include the transition moist to wet sites as well as wet sites (See table 24 C).

The forest type development on telluric 6 moisture regime sites is characterized by a gradual accumulation of raw peat humus, the gradual elimination of white birch from the forest type, and the establishment of a white cedar understory.

On the non-telluric transition moist sites at the intermediate stage, aspen is gradually eliminated from the forest type as the raw humus accumulates and as moisture conditions deteriorate. Larch is also eliminated due to its inability to compete with black spruce.

On the 8 and 9 moisture regime at this stage, the growth of black spruce and larch is very slow compared to the growth of these species on moist and transition moist sites.

(3) The Climax and Post-Climax Stages

(a) The Climax Stage on Fresh Sites

On fresh sites with moderately permeable clay and loam parent soil material, the climax forest type is a balsam fir-white spruce-balsam poplar-aspen cover type with a herb vegetation and a decomposing humus. (See table 24 A). This forest is usually very stable for sites of this type which have a warmer than normal ecoclimate. If these sites have a normal ecoclimate and are undisturbed by fire for a long period, there is a slow deterioration of internal soil drainage conditions. Accompanying this change in soil drainage, the subordinate vegetation changes from a herb vegetation to a mixed vegetation of herbs and mosses (species of Lycopodium, Dicranum and Calliergon), and raw humus begins to accumulate. In this site condition black spruce becomes established. It is present initially as an understory and later as a component of the main stand. This change in physiographic and biotic features can, in the absence of disturbance by fire, continue till they are no longer fresh, but moist sites. This trend of forest type development is more common on fresh sites with slowly permeable clay and loam parent materials, particularly on those sites which have a normal ecoclimate.

(b) The Climax Stage on Moist Sites

On moist sites of both parent material classes, the climax forest is an aspen-balsam fir-white and black spruce cover type with a dominantly herb subordinate vegetation. (See table 24 B). A relatively deep decomposing humus and A1 horizon are characteristic of climax forest on moist sites, particularly those sites which are enriched by nutrients which are brought in by telluric water.

The trend of succession, involving decreased site productivity, which is initiated when climax forest types remain undisturbed by fire for a long period, proceeds further on moist sites than on fresh sites. As stated above, the post-climax forest type on fresh sites is a mixed cover type of deciduous and conifer species. Black spruce is a minor component of this cover. On moist sites this change in forest type can continue to the point where a pure black spruce forest with 6 to 12 inches of accumulating raw peat humus and a dominantly sphagnum moss vegetation are developed. These changes are more likely to occur on moist sites which have a colder than normal ecoclimate. In the early part of the post-climax stage, the cover type is similar to the post-climax type on fresh sites, the subordinate vegetation is dominantly a moss vegetation (Hypnum and Hylochomium) with herbs (Cornus, Linnaea and Coptis). Later small cushions of sphagnum become established and spread from these centres. The forest gradually changes to the pure black spruce forest which is described above.

(c) The Climax Stage on Wet Sites

These include the transition moist to wet sites as well as wet sites (See table 24 C).

The climax forest type on telluric 6 moisture regime sites is a black spruce and white cedar cover type with a moss vegetation which is dominantly sphagnum and an accumulation of one to two feet of raw peat. The post-climax stage which develops on undisturbed sites is an open stand of black spruce and cedar with a very dense alder, cedar and ground hemlock shrub vegetation.

The climax forest type on stagnant transition moist sites is a black spruce cover type with a sphagnum moss ground cover and an accumulation of two to three feet of peat humus. The post-climax type is an open black spruce-larch cover type, with a dense alder and labrador tea shrub vegetation.

On the 8 moisture regime, the climax forest type is a stunted open black spruce cover type with an accumulation of over three feet of raw peat and a sphagnum moss vegetation. The post-climax forest type is an open sphagnum bog without tree cover.

The 9 moisture regime, at the climax stage, is a treeless bog characterized by an accumulation of over five feet of peat and moss.

D. Forest Use Capability of Forest Lands of the Glackmeyer Development Area

(1) The Definition of Forest Use Capability Classes

Forest use capability classes have been devised to indicate the relative potential productivity of tree crops which grow on the various physiographic

sites of Site Region 3. In Site Region 3, potential productivity has been assessed tentatively by means of an empirical evaluation of the yield-quality classes, covering this range of potential productivity, have been devised. Forest use capability classes were then defined in terms of the potential yield-quality production classes. Table 25 shows the yield-quality classes for Site Region 3 and Table 26 the definition of forest use capability classes on the basis of potential yield-quality class production.

(2) The Detailed Description of Forest Use Capability Classes in Terms of Patterns of Physiographic Sites and Forest Types

(a) Excellent Forest Lands

Lands classified as forest use capability class A are associated with the dominantly fresh sites of the kame (k and dk) and stream (GS) landforms. On the kame landform excellent forest land is associated with those sites where the combined effect of relief, relative mass elevation and moderately permeable clay and loam parent soil material modified the local climate to a warmer than the normal ecoclimate for the site region. On the deep clay deposits dissected by eroded gullies, excellent forest land is also associated with fresh sites with a warmer than normal ecoclimate. This landform occurs on the slopes of the large river valleys where there is good air drainage. This air drainage is the dominant factor which influences the local climate of the sites of this landform. Local areas of excellent forest lands are also found on the slight knolls which are adjacent to some troughs of the trough landform. In the northern portion of the Development Area, excellent forest land is commonly associated with sites which are in good condition, and with climax forest types of poplar (dominantly balsam poplar), white spruce and balsam fir; this forest type has been only slightly modified by cutting. In the central and southern portions of the Development Area, the excellent forest lands, for the most part, have been disturbed by fire during the early period of settlement (1911 to 1916) so that the associated sites are in fair condition, and the associated forest types are dominantly pioneer and intermediate forest types of either pure poplar and white birch, or poplar and white birch with an understory of semi-tolerant conifers.

Table 25

YIELD-QUALITY CLASS PRODUCTION
FOR THE PHYSIOGRAPHIC SITES OF SITE REGION 3

Pulpwood (All Species)

| | |
|---|---|
| Class I | over 40 cords per acre (merchantable) |
| Class II | 20 - 40 cords " " " |
| Class III | 12 - 20 cords " " " |
| Class IV | 5 - 12 cords " " " |
| Class V | less than 5 cords per acre " |
| Class N | Nil |

Saw Timber (All Species)

| | |
|---|---|
| Class I | over 25,000 FBM per acre, grades 1 and 2 |
| Class II | 15,000 - 25,000 FBM per acre, grades 1 and 2 |
| Class III | 7,000 - 15,000 FBM per acre, grades 1 and 2<br>7,000 FBM per acre, grade 3 |
| Class IV | 1,000 - 7,000 FBM per acre, all grades |
| Class V | less than 1,000 FBM per acre, all grades |
| Class N | Nil |

Table 26

FOREST USE CAPABILITY CLASSES DEFINED IN TERMS
OF THEIR POTENTIAL YIELD-QUALITY PRODUCTION

| Forest Use Capability Classes | | Potential Yield-Quality Production |
|---|---|---|
| A | Excellent forest land | Class I Saw Timber, Class I Pulpwood (commonly over 50 cords) |
| B | Very good forest land | Class II Saw Timber, Class I Pulpwood (commonly under 50 cords) |
| C | Good Forest land | Class III Saw Timber, Class II Pulpwood |
| D | Fair forest land | Class IV Saw Timber, Class III Pulpwood |
| E | Poor forest land | Class V Saw Timber, Class IV Pulpwood |
| F | Very poor forest land | Class N Saw Timber, Class V Pulpwood |
| G | Extremely poor forest land | Class N Saw Timber, Class N Pulpwood |

(b) Very Good Forest Lands

Lands classified as forest use-capability class B are associated with transition fresh sites which occur mainly on the kame (k), stream (GS) and drumlin (d and dk) landforms. On these landforms very good forest land is associated with sites having a normal ecoclimate which has resulted either from the combined influence of slowly permeable clay and loam parent soil materials and to the influence on physiographic site conditions of a post-climax forest type, or to the influence of a post-climax forest type on the site conditions of sites on moderately permeable clay and loam parent soil materials. Class B forest land, or patterns of A and C forest lands, are more common on the drumlin landform than on the kame landform. The relief of the drumlin landform is gently rolling and the elevated areas of this landform are small in comparison to those of the kame landform; hence the effect of the relief is to permit the normal expression of region climate. In addition to the effect of relief on local climate, the fabric of the parent materials which are dominantly slowly permeable clay has a similar effectivity. Very good forest lands which are associated with undisturbed sites in good condition, usually support a poplar, white spruce, balsam fir and black spruce forest type with a moss and herb subordinate vegetation. Very good forest lands, which are associated with sites which have been disturbed by fire, support pioneer and intermediate forest types either of pure poplar and white birch or poplar and white birch with an understory of semi-tolerant conifers.

*Very good forest land (class B) with a climax forest type of white spruce (centre), black spruce (left), aspen and white birch. Although the development of the individual trees indicate the potentialities of the site, the stocking of trees shown here is less than the potential production, because the forest type is over-mature and many of the older trees of poor vigour have been cut.*

(c) Good Forest Lands

Lands classified as forest use capability class C are associated with the dominantly moist sites of the stream-dissected and troughed plain landtypes. On the moist sites of the deep clay deposits dissected by slow-moving stream courses (CS) and the trough (TS) landform, the relief is flat and the associated forest type is dominantly a climax or post-climax type with an accumulating raw humus. The effect of this relief and forest type is to modify the local climate of these sites to colder than the normal ecoclimate for the site region. On the kame and drumlin landforms local areas of class C lands result from a more advanced stage of modification of the physiographic site features by the associated post-climax forest type than that described above for class B forest lands. On the channel landform areas of class C forest lands are associated with small areas of moist sites where the relief and the fabric of the parent soil materials have permitted the maintenance of the climax forest type which is associated with moist sites.

Good forest lands, which are associated with undisturbed moist sites in the best condition, support a climax forest type of poplar (dominantly aspen), balsam fir, white spruce and black spruce with decomposing humus, a herb subordinate vegetation and a well-developed A1 horizon. This best site condition is found sparingly on moist sites where for long periods forest type succession is not influenced by fire. More over, when the best site condition has been established, the associated climax forest type is not as stable as the climax forest type which is associated with fresh sites; hence if fire continues to play no part in forest-type succession, a decreasing productivity trend is initiated. In this post climax stage, a good site condition is established which is characterized by a herb and moss subordinate vegetation and a slight accumulation of raw humus. In the continued absence of fire, the decreasing productivity trend will continue to the point where the poorest site condition is developed.

The poorest site condition on moist sites is characterized by a pure black spruce forest type with 6" to 12" of raw peat humus and a sphagnum moss subordinate vegetation. Diagram 11 illustrates the differing relationships of disturbance to the site conditions of moist sites resulting from differences in the trends of site productivity. The yield-quality production of moist sites in the poorest condition is similar to that of class D forest lands. However, as indicated in Diagram 11, if these poorest moist sites are severely disturbed by fire, a succession of increasing productivity may be initiated and eventually the potential yield-quality production of class C lands may be attained. Class D lands, on the other hand, cannot be ameliorated by severe fires to attain a production much above the level of the upper limit of class D yield-quality production.

(d) Fair Forest Lands

Lands classified as forest use capability class D are dissected troughed plain and lower slope land-types. The combined effect of relief, forest type and soil type is to modify the local climate of these sites to a colder than the normal for the site region. Transition moist sites with telluric water which transports mineral substances to the site and stimulates humus decomposition are commonly associated with class D forest lands and occur commonly on the lower slope landform. Undisturbed sites of class D forest lands develop in a succession of decreasing productivity. Because of the considerable peat accumulation (2' to 3') and the deep, massive and impermeable glei horizon, even a very severe disturbance will reverse this succession trend only to a limited extent. Very severely burned sites of class D forest lands usually have at least 1 ft. of raw humus remaining after disturbance and although aspen and white birch may become established and form part of the pioneer forest type, the climax forest type which ultimately develops is a well-stocked black spruce forest type with a yield-quality production of 20 to 25 cords per acre. In the absence of fire, a post-climax forest type succeeds the climax type and the decreasing productivity trend is resumed.

*Fair forest land (class D) with a well-stocked stand of black spruce in the background. This lot was settled in the 30's. The land in the foreground was burned, stumped and seeded to comply with settlement regulations, but was not suitable for agriculture (class D agricultural use capability). The pulpwood on such lots provided a subsistence livehood during the depression period, but they were abandoned when the pulpwood was cut off or when more profitable employment became available in the post-depression period.*

## THE CONDITIONING OF MOIST SITES OF THE GLACKMEYER DEVELOPMENT AREA THROUGH DISTURBANCE OF VEGETATION SUCCESSION

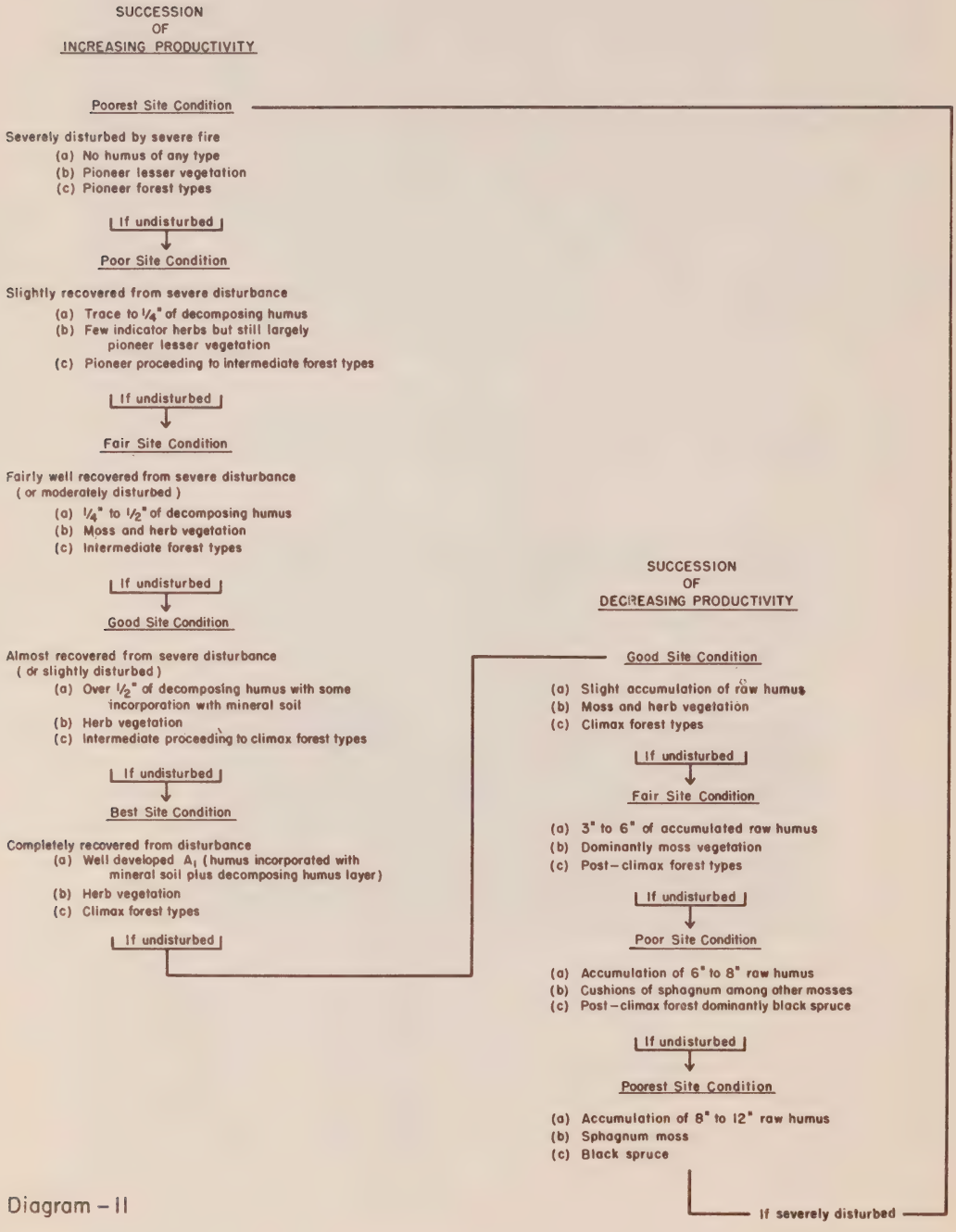



Diagram – II

(e) Poor Forest Lands

Lands classified as forest use capability class E are commonly a pattern of D and F forest lands, but in some cases they may be dominantly transition moist sites which are in the poorest site condition. The sites associated with class E lands have a stagnant soil water condition and there is no decomposition of the accumulating peat. The associated forest types are either a pattern of black spruce and stunted black spruce forest types, or an open black spruce forest type with slow growing trees which are approaching the stunted condition.

(f) Very Poor Forest Lands

Lands classified as forest use capability class F are associated with very wet sites. The sites are dominantly 8 moisture regime sites with a minor proportion of 7 moisture regime sites which are in the poorest site condition and a major proportion of 9 moisture regime sites. The associated forest types are dominantly stunted spruce with a minor proportion of marginally productive black spruce forest types composed of trees which are approaching a stunted condition, and a minor proportion of treeless bogs.

(g) Extremely Poor Forest Lands

Lands classified as forest use capability class G are associated with saturated sites which are too wet for forest growth (deep muskegs). The dominant vegetation type is a treeless bog; there is a minor proportion of stunted black spruce.

E. Site Condition Classes

Variations in forest cover, silvicultural treatment, and other natural disturbances, result in changes of the least stable site features, e.g. humus horizons and local climate. The complex continuum of these changes has been divided into site condition classes. Because levels of site condition are difficult to establish over a broad range of sites, each physiographic site class is rated separately, placing all conditions which occur upon them within a relative scale of five classes, ranging from the best condition to the poorest condition. The best site condition may not be the best condition for the establishment of less demanding species. Jack pine, for example, will suffer from the relatively strong competition of the brush and tree species of a fresh site in the best condition, but may become established on fresh sites which are in fair condition and is most easily established on fresh sites in poor condition. Diagram 11 and the description of the relationships of site condition, disturbance and the trend in succession of forest types illustrate the need for integration of all these factors.

The total complex of features which are associated with the site condition classes of the physiographic sites of the Glackmeyer Development Area are summarized in the following paragraphs.

On fresh sites where the vegetation succession trend is towards an increasing productivity, the change from a fair site condition to the best site condition, which occurs when these sites are not disturbed by fire, results in the following changes of site features:-

(i) An increase in the abundance and cover of the herb vegetation.

(ii) An increase in the potential of the site to produce more vigorous shrubs.

(iii) A well-decomposed humus horizon is built up.

(iv) An A1 horizon is built up as organic matter mixes with the mineral soil (melanization).

Fresh sites in the best condition are relatively stable so that the best site condition tends to be sustained for a long period on these sites. However, if these sites remain undisturbed for very long periods, it is possible that a post-climax forest type may develop and vegetation succession with a decreasing productivity trend may be initiated. When the decreasing productivity trend is initiated and these sites remain undisturbed by fire, they may deteriorate from a fair condition to the poorest condition. The features associated with these changes in site condition are:-

(i) A decrease in the abundance and cover of herb vegetation.

(ii) A decrease in the brush competition potential.

(iii) An increase in the abundance and cover of moss vegetation.

(iv) A raw humus is built up.

(v) An A1 horizon is lacking.

If fresh sites in the poorest condition continue to be undisturbed by fire, the process of gleization is initiated and the sites become transition fresh sites.

The features associated with changes in site conditions for the transition fresh sites are in the main similar to those described above for fresh sites. The characteristic features of transition fresh sites which differ from those of fresh sites are:-

(i) An incipient glei horizon is present in the profiles of all site condition classes.

(ii) The potential for vigorous brush competition is slighly lower than on fresh sites in similar condition.

(iii) The best site condition of transition fresh sites is not as stable as that of fresh sites and consequently in the absence of disturbance by fire a decreasing productivity trend of succession is more apt to be initiated.

The site features of moist sites have already been summarized in Diagram 1, page 199.

The accumulation of moss and raw peat humus is the outstanding site feature of transition moist sites. The dominant trend of forest succession on these sites is of the decreasing productivity type. This dominant trend is only slightly offset by very severe fire. The best site condition of these sites has a raw peat horizon which has been reduced by fire to about 1 ft. in depth. Where complete lack of disturbance has allowed the poorest site condition to develop, raw peat has accumulated to a depth of 3 feet.

The features of wet sites are similar to transition moist sites, except that in their best condition the accumulation of raw humus is reduced to a depth of 3 feet and in their poorest condition these sites are areas of treeless bog with over 5 feet of peat accumulation.

F. Proportionate Production Classes

Within a physiographic site class, variations in disturbances and resulting site conditions will result in a variation in the degree of stocking and the species composition of the forest types which develop on these sites. Sites in the best condition will approach their potential yield-quality production, while similar sites in poorer condition, because they support forest stands of a low degree of stocking or a high proportion of the less valuable species, will have a lesser yield-quality production. The potential yield-quality production is a function of the physiographic site, while the actual production of any area is a function of the combination of its physiographic and biotic site features. This combination of physiographic and biotic sites is termed an ecological unit; it includes the physiographic site class, the condition of the site, and the forest type growing on the site (in particular the degree of stocking and species composition of the forest type). Subjective ratings have been made for the ecological units of the Glackmeyer Development Area to estimate their probable production at rotation age as a percentage of their potential yield-quality production. A five class scale is used for these ratings, the limits of the classes being shown in Table 27.

Table 27

PROPORTIONATE PRODUCTION CLASSES

(Proportionate Production of Ecological Units Estimated as a Percentage of their Potential Yield-Quality Production)

| Class | | |
|---|---|---|
| V | Very high | over 85 % |
| H | High | 60 - 85 % |
| M | Moderate | 30 - 60 % |
| L | Low | 5 - 30 % |
| E | Extremely low | less than 5 % |

G. Degree of Effort Classes

The degree of effort classes are interpretive ratings of the estimated costs of forest management which are required for specific ecological units to attain at maturity a forest type which has a high proportionate production rating. The degree of effort classes are interpreted from the levels of the features of the ecological units. The density of stocking and species composition of the forest type, and the site condition and the potential for vigorous brush competition of the physiographic site are most important features to be considered in these interpretations. For example, the best sites in good condition will require a high degree of effort to attain the objective of management. Special management techniques of harvesting and releasing the young stands will be required because of the high competition potential of the shrub vegetation growing on these sites. The best sites in fair condition will also require a high degree of effort because of the low proportionate production of desirable species of the forest types which usually develop on these sites unless forest mangement assists succession trends.

The relative degree of effort required for the ecological units of the Glackmeyer Development Area has been expressed by a five class scale, ranging from the least effort (class 1) to the highest effort (class 5) where the cost of establishment and maintenance is estimated to be greater than the probable returns from the timber crops which may be grown on these sites. Areas on which forests cannot be grown without extensive changes to the physiographic conditions have been designated as class N. Data regarding the kinds and costs of treatments of the forests of this area and data pertaining to the probable yields of forest types which are produced by natural means or by management are very meagre. Hence, the assessment of degree of effort classes of this study must be regarded as tentative estimates. The

definition of degree of effort classes in terms of management costs is given in Table 28

Table 28

DEGREE OF EFFORT CLASSES
(Defined in Terms of the Per Acre Costs of Establishing and Maintaining Forest Types of a High Proportion Production)

| Class | | |
|---|---|---|
| 1 | Very low | 0 - $15.00 per acre |
| 2 | Low | $15.00 to $30.00 per acre |
| 3 | Moderate | $30.00 to $60.00 " " |
| 4 | High | $60.00 to $100.00 " " |
| 5 | Very high | over $100.00 per acre |
| N | Cost in excess of probable returns from the tree crops which may be grown. | |

H. The Application of Forest Use Capability Classes to Forest Management

The Forest Use Capability Map (No. 8) is not designed to provide the forest manager with a plan for forest management. Rather it is designed to assist the forest manager by suggesting the possible alternative courses of management. Natural land and forest units (ecological units) have been proposed within which estimates are made of their potential productivity, their proportionate production, and the degree of effort which would be required to attain a high proportion of their potential. There are several possible levels of production from a given ecological unit which may be obtained by expending varying degrees of effort of management.

The degree of effort which a forest manager exerts upon a specific ecological unit of a forest area will depend upon (i) the relationships of degree of effort to the predicted production of the ecological units, (ii) upon the area available for forest production when the needs for forest land are integrated with the needs of other users of land, and (iii) upon an estimate of future wood requirements. The estimate of future cannot be limited to the production of forests which are profitable to the forest manager as a short-term business because:-

(i) A large segment of the national economy will continue to be dependent on the supply of forest ~~productions~~. If this segment of the economy is maintained or strengthened, the value of forests will

be far greater than that indicated by the balance sheets of the individual forest properties.

(ii) The productivity of forest lands must be maintained or improved.

(iii) National welfare considerations indicate a growing need for forests. The recreational value of forests will become increasingly important as changes in the industrial arts permit increased leisure time for the masses.

# PRINCIPLES AND METHODS REQUIRED FOR PLANNING THE MULTIPLE USE OF LAND IN THE GLACKMEYER DEVELOPMENT AREA

## A. The Meaning of Multiple Land Use

The natural resources of many areas are such that returns from more than one land use are not only possible but desirable. In the past, there has been little planning for multiple land use. For example, if an area was to be developed for farming, automatically all the forests were cut down without considering the possibility that a proportion of the area in forest would enhance the value of the whole. Similarly, if prairie land could produce good wheat crops with little effort, there was no reason to be concerned about livestock production. Thus, the possibility that, in time, the maintenance of the productivity of the land may require a mixed farming economy is ignored. Nevertheless, in many countries, a combined economy has evolved over the centuries (on both farm unit and community scales) which provides more revenue and a better way of life than that which a single use economy could provide.

This is particularly true of the farm-forest-wildlife-recreation economy which supports the majority of the present residents of the rural areas of Northern Ontario, north of a line drawn from Orillia to Pembroke. For any individual enterprise, the economy may be only one, or a combination of any two, of farming, forestry, trapping, tourist catering and commercial fishing. The regional economy, however, is a combination of all of these with each one assuming a major role.

## B. Review of Principles Outlined in Earlier Sections

The role which natural land patterns play in determining land use has been discussed in Section I, pages 40-47. The physical basis of landtype patterns is landform, which includes both the relief of an area and the materials which give expression to the relief. Since the productivity of landform varies with regional climate, landtypes are established to express combinations of both landform and climate.

However, landtype patterns are not strait-jackets which rigidly determine land use, but provide limits for a range of uses. Thus the land-use patterns which are associated with any specific landtype patterns will vary from time to time and from place to place depending upon the type and intensity of the culture practiced.

Since the local and regional relationship between land use and landtype patterns can be ascertained only through an integrated study at both local and

regional levels, the reference area approach has been used in this pilot study. The difference between this ecological approach and the technologic approach now being used in many land-use surveys is discussed on pages 43-47.

This ecological approach to land-use studies requires a classification which deals with ecological complexes rather than with individual features of landform, climate, soil and crops. In order to illustrate the feature complex method of land classification, the Cochrane kame landtype was used as an example on pages 45-46.

C. Land-Use Classifications to Indicate the Relative Importance of the Specific Land Uses within a Multiple Land-Use Plan

Two classifications are required to indicate the comparative position of any specific land use for any block of land. The first compares the degree of development of a specific land use within a planning unit with that of the same land use in other areas. The second is a comparison of the relative importance of the various land uses within a specific planning unit.

For making inter-unit comparisons within a region, the following classes are suggested:-

(i) Primary
(ii) Secondary
(iii) Tertiary
(iv) Quaternary

With the use of these classes, a map of an area can be drafted to indicate the relative degree of present or recommended development of the land within these blocks for agriculture, irrespective of additional land uses which may be developed on the same block.

The classes proposed for intra-unit comparison, either economically or socially, area:-

(i) Major
(ii) Co-major
(iii) Sub-major
(iv) Minor
(v) Sub-minor

It commonly occurs that agriculture is the major land use on a block on which agricultural development has reached a primary level for the region. However, other land uses may assume such proportions that these, too, may be considered a primary land use.

For example, Pelee Island, a primary agricultural area, is also a primary area for the production of pheasants. Let us now make an intra-unit comparison of these two primary land uses. Although the revenue from farm crops is at least five times that of the revenue from pheasants, yet the additional revenue obtained from the production of pheasants so adds to the economy of the area as a whole that wildlife can be considered a sub-major land use.

In a similar way, forestry has been, and should continue to be, a co-major or sub-major land use in most of the agricultural communities of Northern Ontario.

D. The Integration of Forestry and Agricultural Land Uses Within the Multiple Land-Use Plan

The attempt to establish a full-time commercial type of agriculture on all lands in Northern Ontario has failed. Although Southern Ontario has been, for many years, a region of primary agriculture, there are many areas where there has been a recognition of the need for a balanced land use which includes forest and wildlife management. It is too much to expect that all regions in the north can be developed for agriculture in the foreseeable future. Some may never be highly developed. Others, because of economic and social factors, will not be developed for many years to come. In the meantime they can contribute greatly to the provincial economy through a well-integrated program of all-crop husbandry.

Forestry rather than agriculture is the most fitting use for most of the land of Northern Ontario, even for those lands whose agricultural potential is high enough to permit of farming in the near future. Practically all of the original forest presently accessible has been cut or burned. Therefore, most of the forest area requires planting and most of the forest now growing, whether naturally established or planted, requires tending.

Forest tending requires forest settlements, communities not of woodcutters but of farm-forest workers. To do the job ahead, these must have the husbandry skills of the farmer rather than those of the bush-cutter. In order to live a full life, they must be an integral part of the rural communities of the Cochrane Clay Belt. Since all factors combine to indicate a gradual transition from a forestry to a farm economy, the proposed communities must be envisioned as a combination of farmers and farm-foresters.

E. The Integration of Wildlife Land Use Within the Multiple Land-Use Plan

The principles of integrating Wildlife Land Use into the Multiple Land-Use Plan is presented on page 97, Section IV.

## F. The Integration of the Recreational Land Use Within the Multiple Land-Use Plan

The aethetic phase of recreational use of land is one which should not be overlooked in multiple land-use planning. Sir Dudley Stamp on page 426 of "The Land of Britain" emphasizes the role which this phase of land use plays in that country as follows:- "In a way the whole countryside is a national asset to be used for the benefit, including the enjoyment, of all. So regarded, the landowner, the forester and the farmer are the nation's unpaid gardners since they keep in order this national estate incidentally to their other work ..... The hill lands of this country (Britain) should be so planned as to serve the needs of forestry and of hill sheep farming, to serve at the same time as gathering grounds for water supply, whether for industrial or domestic consumption or for the generating of electricity, and that there is nothing incompatible between these uses and the regulated access of those who seek fresh air and recreation in the remoter parts of the country."

In Northern Ontario there are few unpaid gardeners since the landscape is largely neglected from the aesthetic point of view. The development of an attractive boreal type of farm-forest landscape would pay dividends both from the standpoint of a fuller life for the residents of the Cochrane Clay Belt and from the increased revenues from tourists.

## G. The Principles and Methods of Regional Geography in Multiple Land-Use Planning

In order to plan the land use of any local area, it is not enough to know the capabilities of the land of that area. These must be evaluated with reference to those of a larger area where similar planning would apply and of which this local area is a part, namely a geographic region. The capabilities of this region must be compared with other regions which may affect the economy of the region under study. Multiple land-use planning must of necessity be regional planning.

The study of regions lies in the field of geography. The principles and methods of regional geography are highly developed and encompass such a large field that no attempt will be made to review them here, except for a few brief statements.

A geographic region is an area in which there has been created a homogeneity of economic and social structure through the combination of the factors of the natural environment with factors inherent in the human populations. Neither environment nor human endeavour alone determine the resulting society but a combination of both of these. Homogeneity of structure does not exclude variation, but rather it refers to the integration of such variations within a unified whole. The integration is multiple land-use planning. The whole is the geographic region.

The brief period in which settlement has been progressing in the Cochrane Clay Belt has not been sufficient for the creation of a homogeneous, social and economic structure. The present structure must be viewed in this light. The use of present settlement patterns to forecast the possible future courses of their development must therefore be speculative. Although there are some trends in settlement development which may be thoroughly analyzed and used to predict future developments, in the main the future development of settlement must be gauged by intuitions which are based upon all the available knowledge of settlement at both the local and regional levels of integration.

In conclusion it should be stated in the words of Isaiah Bowman, the dean of 'settlement' geography, that "the environment and its human relationships are but parts of a more significant totality. That is why a geography that is limited to a study of human relationships of natural conditions is incomplete from the standpoint of human processes and community living. But this is no more than if one said that a purely economic study is likewise incomplete. We are all dealing, always, in fragments. The universe is not reducible to the limits of one mind in a moment of time. Neither is a community, any community, a smooth-working cosmos, cause and effect all neatly tied together." (Geography in Relation to the Social Sciences, p. 178).

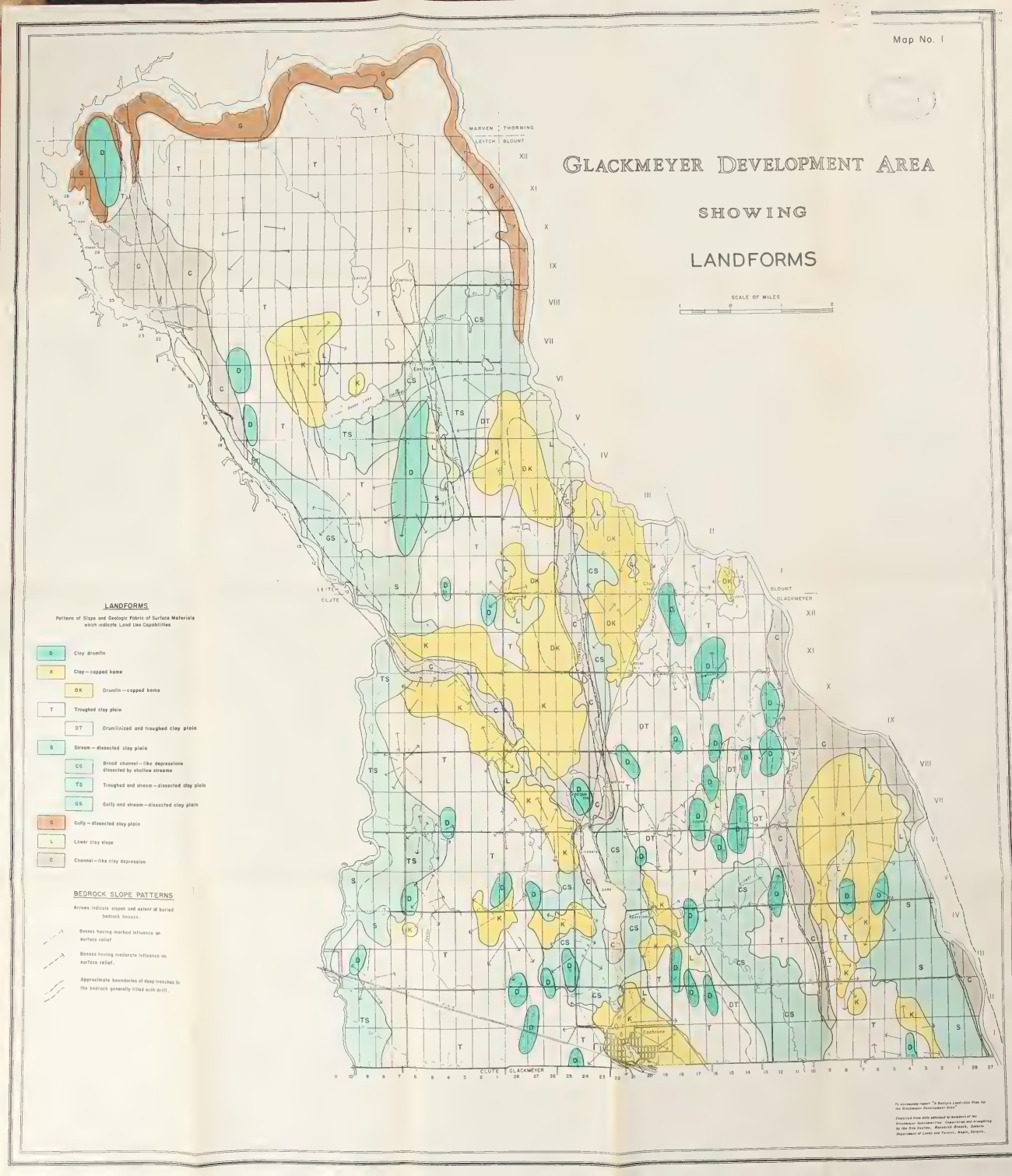
Map No. 1

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## LANDFORMS

SCALE OF MILES




### LANDFORMS

Patterns of Slope and Geologic Fabric of Surface Materials which indicate Land Use Capabilities

- D — Clay drumlin
- K — Clay — capped kame
- DK — Drumlin — capped kame
- T — Troughed clay plain
- DT — Drumlinized and troughed clay plain
- S — Stream — dissected clay plain
- CS — Broad channel — like depressions dissected by shallow streams
- TS — Troughed and stream — dissected clay plain
- GS — Gully and stream — dissected clay plain
- G — Gully — dissected clay plain
- L — Lower clay slope
- C — Channel — like clay depression

### BEDROCK SLOPE PATTERNS

Arrows indicate slopes and extent of buried bedrock bosses.

- Bosses having marked influence on surface relief
- Bosses having moderate influence on surface relief.
- Approximate boundaries of deep trenches in the bedrock generally filled with drift.

To accompany report "A Multiple Land-Use Plan for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Subcommittee - Inspection and mapping by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario.

Map No. 2



# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## PATTERNS OF PHYSIOGRAPHIC SITES

SCALE OF MILES

0 1 2

MARVEN | THORNING
LEITCH | BLOUNT

Eastford

LEITCH
CLUTE

BLOUNT
GLACKMEYER

Cochrane

CLUTE GLACKMEYER

### LANDTYPE

**PATTERNS OF TEXTURE AND PETROGRAPHY CLASSES**

C Cochrane Landtype (high lime clay)

J Jessop Landtype (acid peat)

**PATTERN OF SLOPE AND FABRIC CLASSES**
(being subdivisions of the Cochrane Landtype)

Ck Kames capped with Cochrane clay till.

Cd Cochrane clay drumlins.

Ct Troughed till plains of Cochrane clay.

Cs Stream-dissected till and lacustrine plains of Cochrane clay (includes gullies)

Cc Channelled linear depressions filled with Cochrane clay till overlain in places by loamy till and by sandy or gravelly alluvium

Cl Cochrane clay occurring on lower slopes (of drumlins and kames) and in smooth depressions between kames and drumlins.

### SOIL MOISTURE

**MAPPING UNITS**

**PATTERNS OF SOIL MOISTURE REGIME CLASSES**
(being the dominant moisture class or classes as designated on map, combined with other moisture classes to be inferred from the landtype)

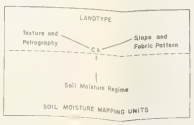
| | |
|---|---|
| f f-ff / f-m ff | Dominantly fresh sites |
| m-ff m / m-fm m- w / fm-m fm / fm- w | Dominantly moist sites |
| w-m w-fm / w / s | Dominantly wet sites / Dominantly saturated sites |

**TAXONOMIC UNITS**

**SOIL MOISTURE REGIME CLASSES**

| BROAD SCALE | BASIC SCALE | SUPPLEMENTARY SCALE |
|---|---|---|
| f fresh | 1 mod. fresh | |
| | 2 fresh | |
| | 3 very fresh | |
| | | ff transition fresh to moist |
| m moist | 4 mod. moist | |
| | 5 moist | |
| | 6 very moist | |
| | | fm transition moist to wet |
| w wet | 7 mod. wet | |
| | 8 wet | |
| s | 9 saturated | |

EXAMPLE OF MAPPING SYMBOL FOR PHYSIOGRAPHIC SITE PATTERNS




To accompany report "A Multiple Land-Use Plan for the Glackmeyer Development Area".

Compiled from data obtained by members of the Glackmeyer Subcommittee, Completed and designed by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

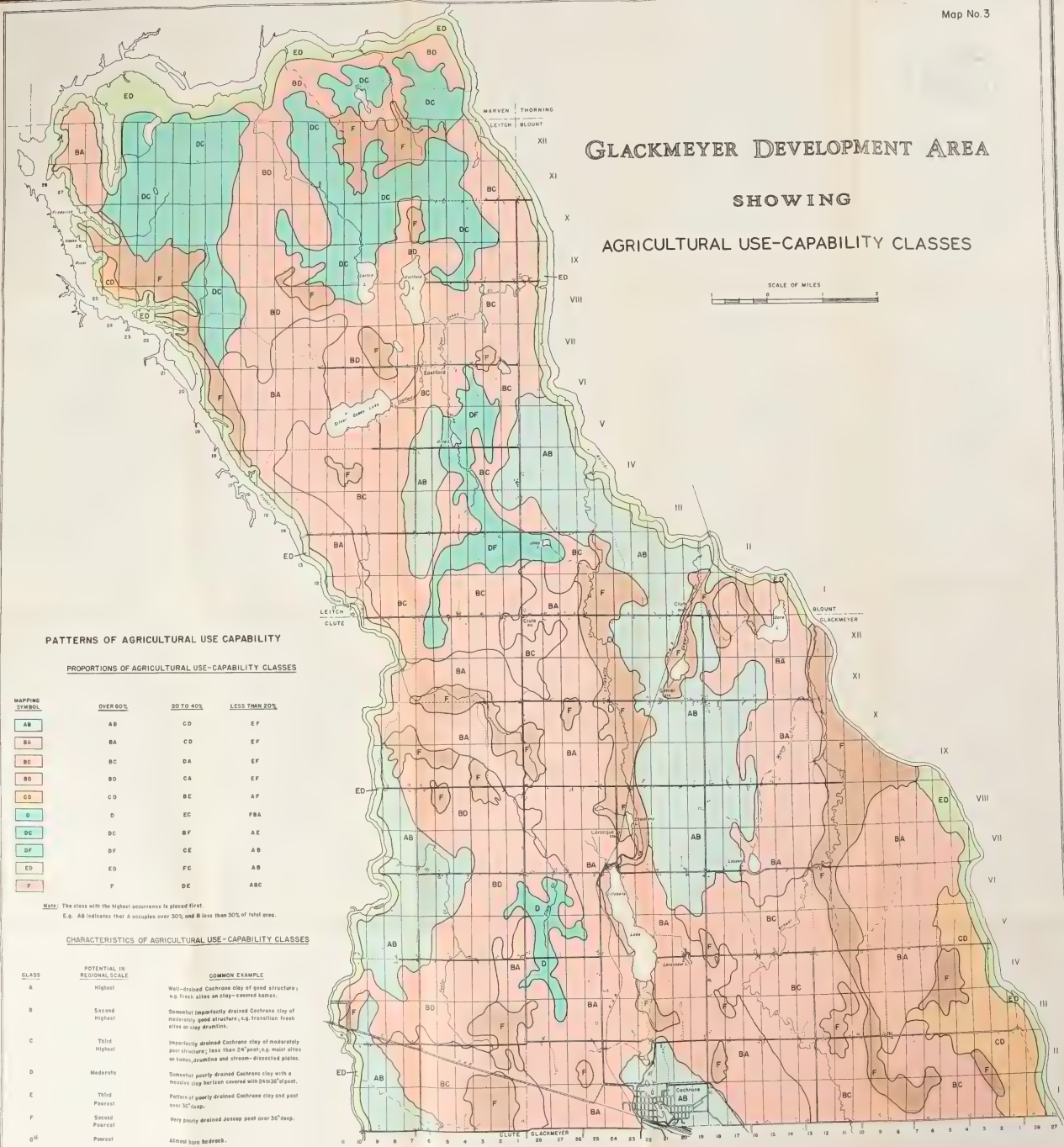
Map No. 3

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## AGRICULTURAL USE-CAPABILITY CLASSES

SCALE OF MILES




### PATTERNS OF AGRICULTURAL USE CAPABILITY

#### PROPORTIONS OF AGRICULTURAL USE-CAPABILITY CLASSES

| MAPPING SYMBOL | OVER 60% | 20 TO 40% | LESS THAN 20% |
|---|---|---|---|
| AB | AB | CD | EF |
| BA | BA | CD | EF |
| BC | BC | DA | EF |
| BD | BD | CA | EF |
| CD | CD | BE | AF |
| D | D | EC | FBA |
| DC | DC | BF | AE |
| DF | DF | CE | AB |
| ED | ED | FC | AB |
| F | F | DE | ABC |

Note: The class with the highest occurrence is placed first.
E.g. AB indicates that A occupies over 30% and B less than 30% of total area.

#### CHARACTERISTICS OF AGRICULTURAL USE-CAPABILITY CLASSES

| CLASS | POTENTIAL IN REGIONAL SCALE | COMMON EXAMPLE |
|---|---|---|
| A | Highest | Well-drained Cochrone clay of good structure; e.g. fresh sites on clay-covered kames. |
| B | Second Highest | Somewhat imperfectly drained Cochrone clay of moderately good structure; e.g. transition fresh sites on clay drumlins. |
| C | Third Highest | Imperfectly drained Cochrone clay of moderately poor structure; less than 24" peat; e.g. moist sites on loams, drumlins and stream-dissected plains. |
| D | Moderate | Somewhat poorly drained Cochrone clay with a massive clay horizon covered with 24 to 36" of peat. |
| E | Third Poorest | Pattern of poorly drained Cochrone clay and peat over 36" deep. |
| F | Second Poorest | Very poorly drained Jessop peat over 36" deep. |
| G* | Poorest | Almost bare bedrock. |

*Areas of class G in Glackmeyer are too small to be recognized on broad scale maps

To accompany report "A Multiple Land-Use Plan for the Glackmeyer Development Area".

Compiled from data obtained by members of the Glackmeyer Subcommittee - Conservation and Recreation - by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario.

Map No. 40

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## PROGRESS OF LAND GRANTS

SCALE OF MILES





OWNERSHIP OF LAND

CLASSIFIED RURAL AREAS

- Patented
- Located
- Crown

NON CLASSIFIED URBAN AREAS

- Present urban subdivisions

DATA COLLECTED 1956 – 57

To accompany report "A Multiple Land-Use Plan for the Kinoshagan Development Area"

Compiled from data obtained by members of the Kinoshagan Subcommittee, 1956-57. Compilation and draughting by the Site Section, Resource Branch, Ontario Department of Lands and Forests, Maple, Ontario

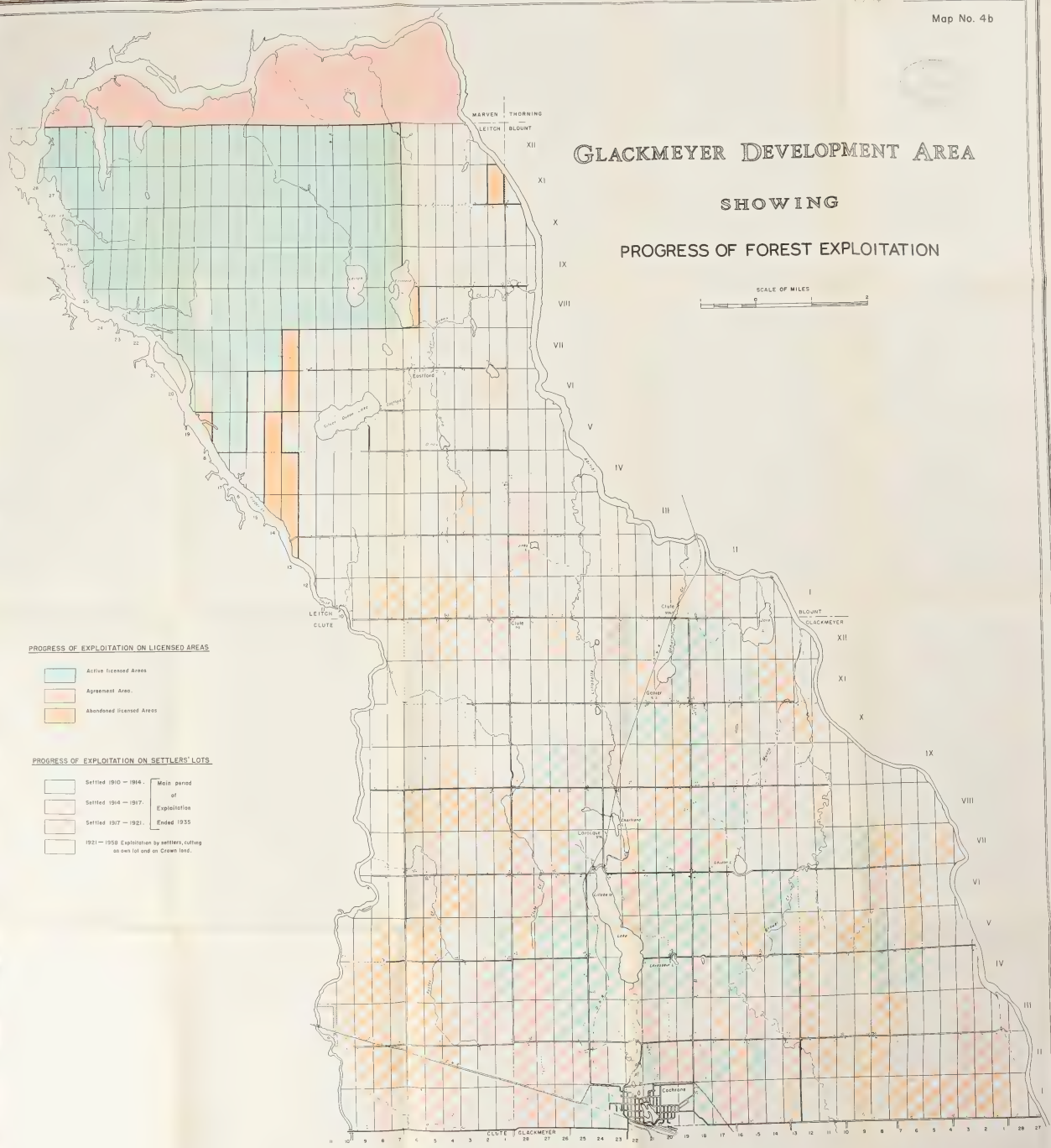
Map No. 4b

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## PROGRESS OF FOREST EXPLOITATION

SCALE OF MILES




PROGRESS OF EXPLOITATION ON LICENSED AREAS

- Active licensed Areas
- Agreement Area.
- Abandoned licensed Areas

PROGRESS OF EXPLOITATION ON SETTLERS' LOTS

- Settled 1910 — 1914. — Main period of Exploitation
- Settled 1914 — 1917. — Main period of Exploitation
- Settled 1917 — 1921. — Ended 1935
- 1921 — 1958 Exploitation by settlers, cutting on own lot and on Crown land.

To accompany report "A Historic Land-Use Map for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Independent Cooperative and arranged by the Map Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

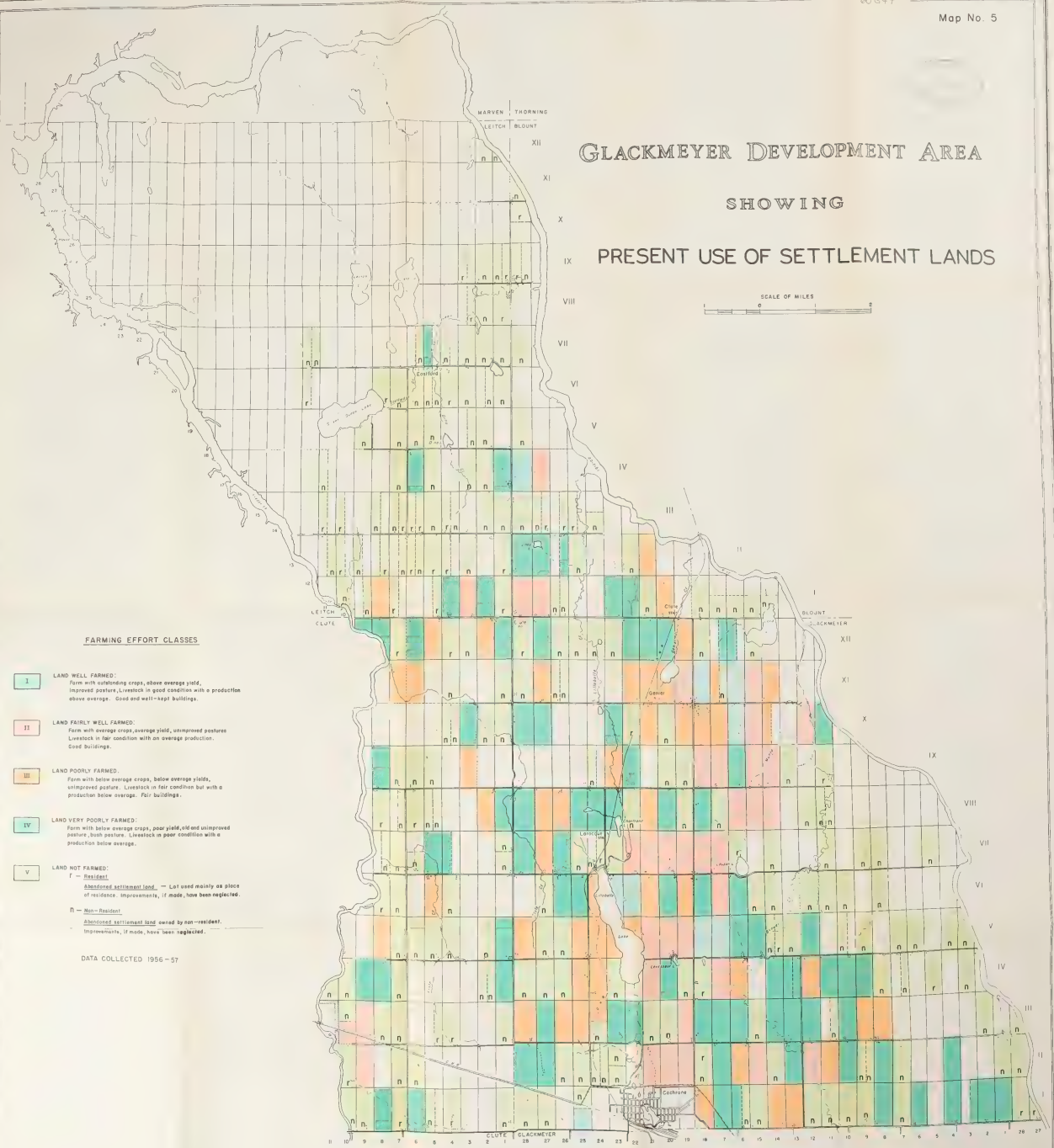
Map No. 5

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## PRESENT USE OF SETTLEMENT LANDS

SCALE OF MILES




### FARMING EFFORT CLASSES

**I** — LAND WELL FARMED:
Farm with outstanding crops, above average yield, improved pasture. Livestock in good condition with a production above average. Good and well-kept buildings.

**II** — LAND FAIRLY WELL FARMED:
Farm with average crops, average yield, unimproved pastures Livestock in fair condition with an average production. Good buildings.

**III** — LAND POORLY FARMED:
Farm with below average crops, below average yields, unimproved pasture. Livestock in fair condition but with a production below average. Fair buildings.

**IV** — LAND VERY POORLY FARMED:
Farm with below average crops, poor yield, old and unimproved pasture, bush pasture. Livestock in poor condition with a production below average.

**V** — LAND NOT FARMED:

r — Resident

Abandoned settlement land. — Lot used mainly as place of residence. Improvements, if made, have been neglected.

n — Non-Resident

Abandoned settlement land owned by non-resident. Improvements, if made, have been neglected.

DATA COLLECTED 1956-57

To accompany report "A Manitoba Land-Use Plan for the Glackmeyer Development Area".

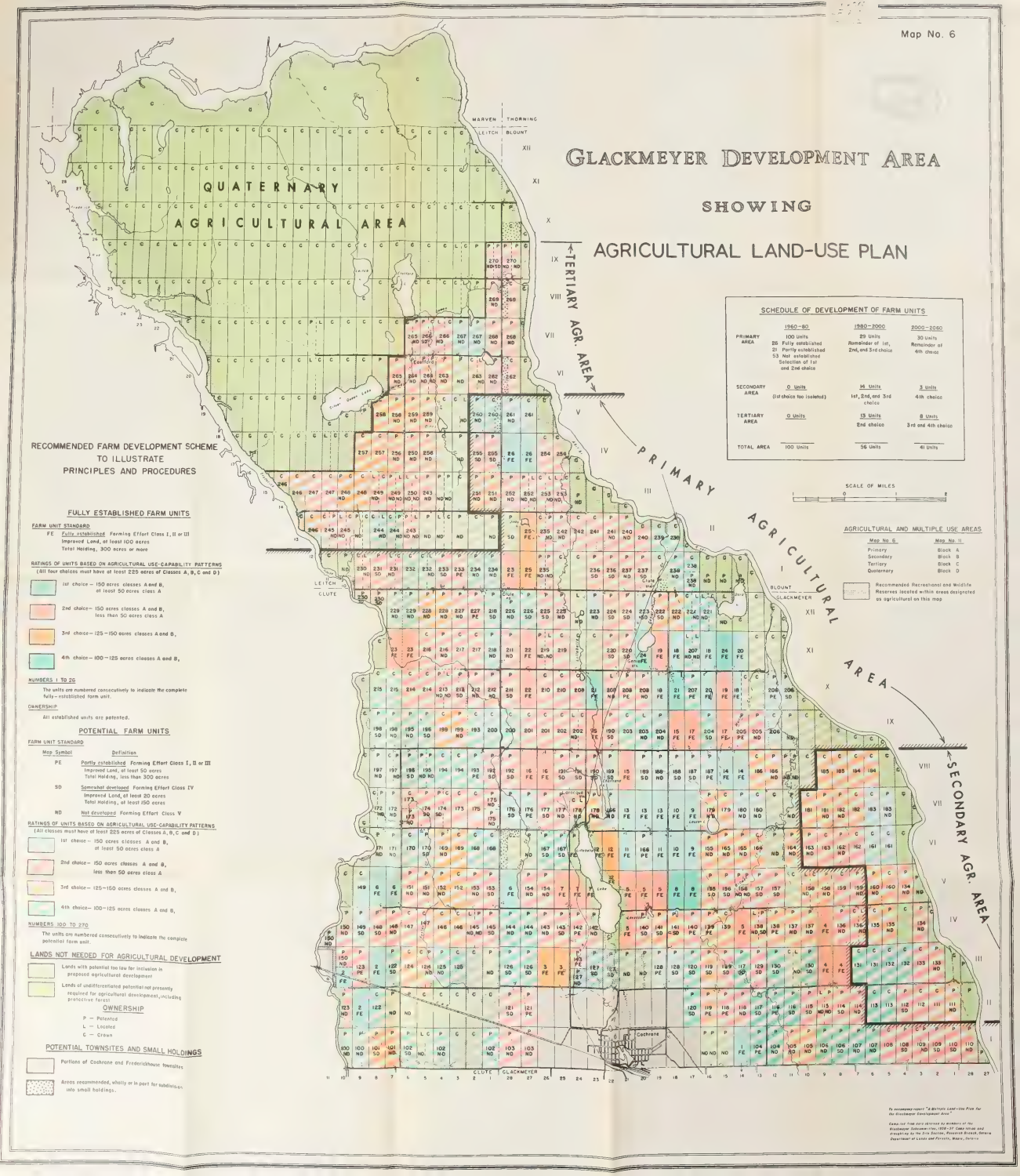
Data fed from data obtained by members of the Glackmeyer Subcommittee, 1956-57 Committee and assistance by the Dominion Forest Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

Map No. 6

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## AGRICULTURAL LAND-USE PLAN




### SCHEDULE OF DEVELOPMENT OF FARM UNITS

| | 1960–80 | 1980–2000 | 2000–2060 |
|---|---|---|---|
| PRIMARY AREA | 100 Units<br>26 Fully established<br>21 Partly established<br>53 Not established<br>Selection of 1st and 2nd choice | 29 Units<br>Remainder of 1st, 2nd, and 3rd choice | 30 Units<br>Remainder of 4th choice |
| SECONDARY AREA | 0 Units<br>(1st choice too isolated) | 14 Units<br>1st, 2nd, and 3rd choice | 3 Units<br>4th choice |
| TERTIARY AREA | 0 Units | 13 Units<br>2nd choice | 8 Units<br>3rd and 4th choice |
| TOTAL AREA | 100 Units | 56 Units | 41 Units |

SCALE OF MILES

0 1 2

### AGRICULTURAL AND MULTIPLE USE AREAS

| Map No. 6 | Map No. 11 |
|---|---|
| Primary | Block A |
| Secondary | Block B |
| Tertiary | Block C |
| Quaternary | Block D |

Recommended Recreational and Wildlife Reserves located within areas designated as agricultural on this map

### RECOMMENDED FARM DEVELOPMENT SCHEME TO ILLUSTRATE PRINCIPLES AND PROCEDURES

#### FULLY ESTABLISHED FARM UNITS

FARM UNIT STANDARD

FE — Fully established Farming Effort Class I, II or III
Improved Land, at least 100 acres
Total Holding, 300 acres or more

RATINGS OF UNITS BASED ON AGRICULTURAL USE-CAPABILITY PATTERNS
(All four choices must have at least 225 acres of Classes A, B, C and D)

- 1st choice – 150 acres classes A and B, at least 50 acres class A
- 2nd choice – 150 acres classes A and B, less than 50 acres class A
- 3rd choice – 125–150 acres classes A and B,
- 4th choice – 100–125 acres classes A and B,

NUMBERS 1 TO 26

The units are numbered consecutively to indicate the complete fully-established farm unit.

OWNERSHIP

All established units are patented.

#### POTENTIAL FARM UNITS

FARM UNIT STANDARD

| Map Symbol | Definition |
|---|---|
| PE | Partly established Farming Effort Class I, II or III<br>Improved Land, at least 50 acres<br>Total Holding, less than 300 acres |
| SD | Somewhat developed Farming Effort Class IV<br>Improved Land, at least 20 acres<br>Total Holding, at least 150 acres |
| ND | Not developed Farming Effort Class V |

RATINGS OF UNITS BASED ON AGRICULTURAL USE-CAPABILITY PATTERNS
(All classes must have at least 225 acres of Classes A, B, C and D)

- 1st choice – 150 acres classes A and B, at least 50 acres class A
- 2nd choice – 150 acres classes A and B, less than 50 acres class A
- 3rd choice – 125–150 acres classes A and B,
- 4th choice – 100–125 acres classes A and B,

NUMBERS 100 TO 270

The units are numbered consecutively to indicate the complete potential farm unit.

#### LANDS NOT NEEDED FOR AGRICULTURAL DEVELOPMENT

- Lands with potential too low for inclusion in proposed agricultural development
- Lands of undifferentiated potential not presently required for agricultural development, including protective forest

#### OWNERSHIP

P — Patented
L — Located
C — Crown

#### POTENTIAL TOWNSITES AND SMALL HOLDINGS

- Portions of Cochrane and Frederickhouse townsites
- Areas recommended, wholly or in part for subdivision into small holdings.


To accompany report "A Tentative Land-Use Plan for the Glackmeyer Development Area"

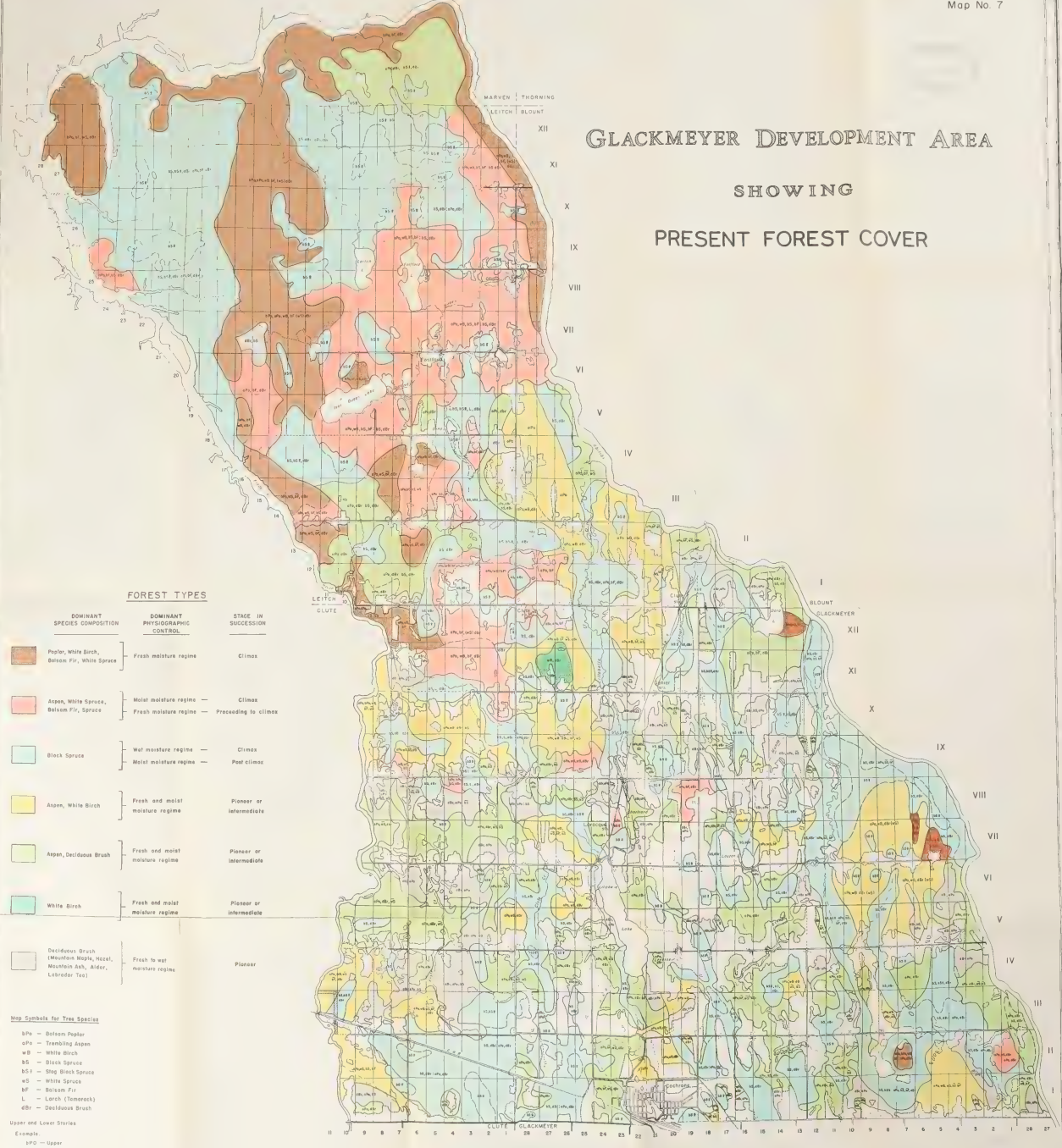
Compiled from data obtained by members of the Glackmeyer Subcommittee, 1959–61 Cadastral and drawing by the Civil Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

Map No. 7

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## PRESENT FOREST COVER




### FOREST TYPES

| DOMINANT SPECIES COMPOSITION | DOMINANT PHYSIOGRAPHIC CONTROL | STAGE IN SUCCESSION |
|---|---|---|
| Poplar, White Birch, Balsam Fir, White Spruce | Fresh moisture regime | Climax |
| Aspen, White Spruce, Balsam Fir, Spruce | Moist moisture regime — Fresh moisture regime — | Climax — Proceeding to climax |
| Black Spruce | Wet moisture regime — Moist moisture regime — | Climax — Post climax |
| Aspen, White Birch | Fresh and moist moisture regime | Pioneer or intermediate |
| Aspen, Deciduous Brush | Fresh and moist moisture regime | Pioneer or intermediate |
| White Birch | Fresh and moist moisture regime | Pioneer or intermediate |
| Deciduous Brush (Mountain Maple, Hazel, Mountain Ash, Alder, Labrador Tea) | Fresh to wet moisture regime | Pioneer |

Map Symbols for Tree Species

- bPa — Balsam Poplar
- aPo — Trembling Aspen
- wB — White Birch
- bS — Black Spruce
- bSs — Stag Black Spruce
- wS — White Spruce
- bF — Balsam Fir
- L — Larch (Tamarack)
- dBr — Deciduous Brush

Upper and Lower Stories

Example

- bPO — Upper
- bPO — Lower

To accompany report "A Multiple Land-Use Plan for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Subcommittee, 1956-57. Completed and completing by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

Map No. 8

# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## FOREST USE CAPABILITIES

SCALE OF MILES

1 0 1 2

### DEFINITION OF FOREST USE CAPABILITY CLASSES IN TERMS OF POTENTIAL YIELD-QUALITY PRODUCTION, AND PHYSIOGRAPHIC CONTROL

| MAPPING UNITS | TAXONOMIC FOREST USE CAPABILITY CLASSES | POTENTIAL YIELD-QUALITY PRODUCTION | PHYSIOGRAPHIC CONTROL |
|---|---|---|---|
| A \| AB \| AC Dominantly Class A | Class A – Excellent | Saw Timber Class I (Over 25,000 FBM per acre grades I and 2) Pulpwood Class I (commonly Over 50 cords per acre) | 1 Mod. Fresh |
| | | | 2 Fresh |
| B Dominantly Class B | Class B – Very Good | Saw Timber Class II (15,000–25,000 FBM per acre grades I and 2) Pulpwood Class I (commonly 40 – 50 cords per acre) | 3 Very Fresh |
| C \| CB \| CD \| CF Dominantly Class C | Class C – Good | Saw Timber Class III (7,000–15,000 FBM per acre grades I and 2 or over 7,000 FBM per acre grade 3 ) Pulpwood C ass II 20 – 40 | 4 Mod Moist |
| | | | 5 Moist |
| D \| DC Dominantly Class D | Class D – Fair | Saw Timber Class IV (1,000–7,000 FBM per acre all grades) Pulpwood Class III 12 – 20 | 6 Very Moist |
| E Dominantly Class E | Class E – Poor | Saw Timber Class V (Less than 1,000 FBM per acre all grades) Pulpwood Class IV 5 – 12 | 7 Mod. Wet |
| F \| FC \| FD Dominantly Class F | Class F – Very Poor | Saw Timber Class N Pulpwood Class V less than 5 | 8 Wet |
| G Dominantly Class G | Class G – Extremely Poor | Saw Timber Class N Pulpwood Class N nil | 9 Saturated |

EXAMPLE OF MAPPING SYMBOL FOR FOREST USE CAPABILITY RATING

Forest Use Capability Classes

A F M 3

- Degree of Effort Class
- Proportionate Production Class
- Site Condition Class.

### SITE CONDITION CLASSES

(Comparative Condition within Physiographic Site Class)

b — best
g — good
f — fair
p — poor
v — very poor

### PROPORTIONATE PRODUCTION CLASSES

(Per Cent of Potential Yield-Quality Production Class)

V — Very high 85 %
H — High 60 — 85 %
M — Moderate 30 — 60 %
L — Low 5 — 30 %
E — Extremely low less than 5 %

### DEGREE OF EFFORT CLASSES

(Cost of Establishment and Maintenance of Forest to Attain High Proportionate Production )

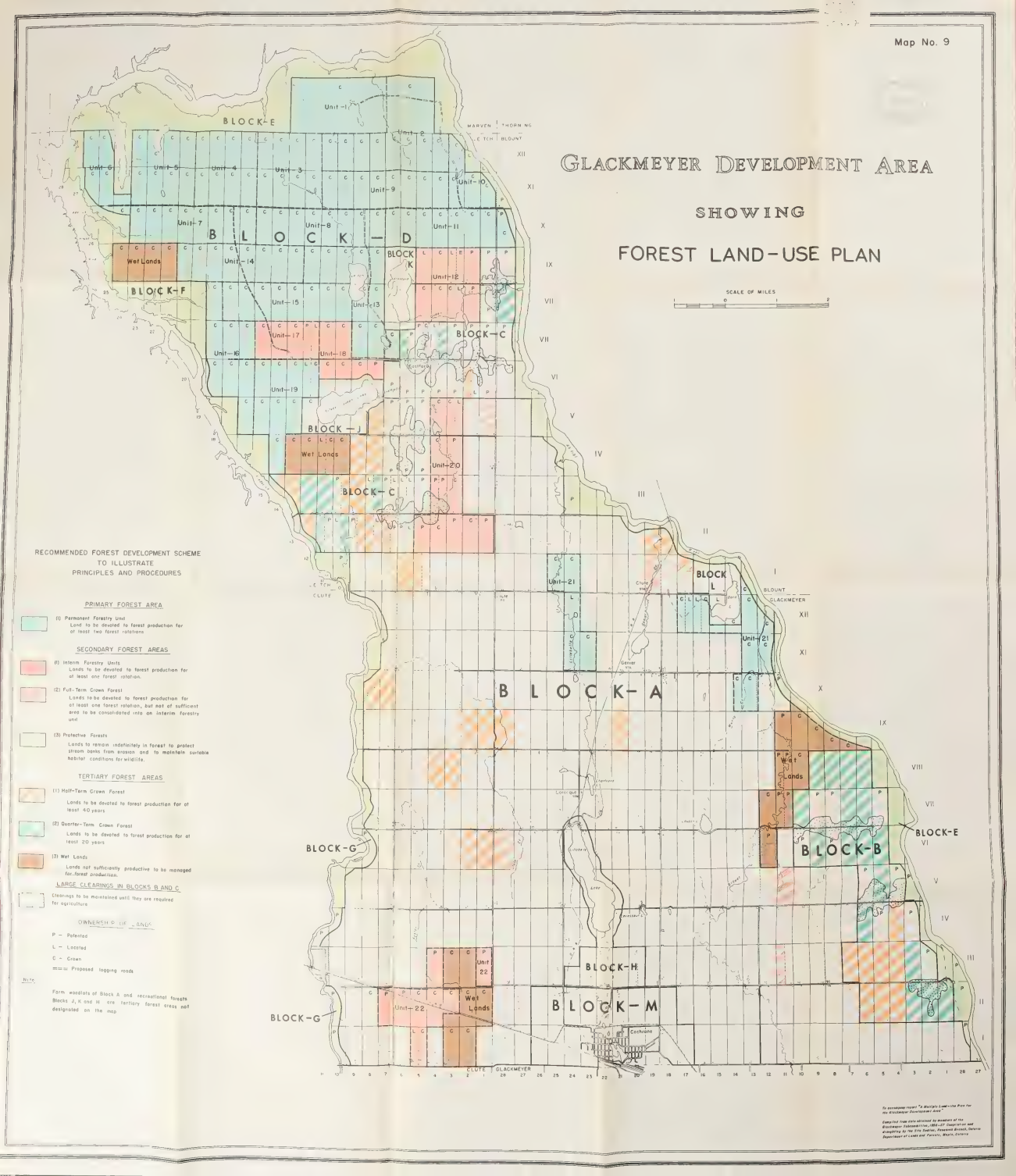
1 — very low 0 to $15 — per acre
2 — low $15 to $30 — per acre
3 — moderate $30 to $60 — per acre
4 — high $60 to $100 — per acre
5 — very high over $100 — per acre
N — Non-commercial forest, degree of effort to attain marchantable forest not justified by probable returns

MARVEN | THORNING
LEITCH | BLOUNT
CLUTE
GLACKMEYER
Cochrane

To accompany report "A Working Land-Use Plan for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Subcommittee, 1956 - 57 Completed and Accepted by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

Map No. 9




To accompany report "A Multiple Land-Use Plan for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Subcommittee, 1954-57 Inclusive and compiled by the Site Section, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario

Map No. 10



# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## WILDLIFE AND RECREATIONAL LAND-USE PLAN

SCALE OF MILES

RECOMMENDED SCHEME FOR DEVELOPMENT OF WILDLIFE* AND RECREATIONAL LAND USES TO ILLUSTRATE PRINCIPLES AND PROCEDURES
(* all wildlife including fish)

### AREAS OF PRIMARY WILDLIFE LAND USE
(Recreational Land Use, secondary)

(1) Protective Forests and Water Access Areas:
- (a) Use by public to be assured.
- (b) Crown wildlife management based on species, locality and major associated use areas.
- (c) Possible additional areas of primary recreation in future.

(2) Wetland Areas:
- (a) Use by public to be assured.
- (b) Crown wildlife management based on species, locality and major associated use areas.

(3) Production Forestry Units:
- (a) Use by public to be assured.
- (b) Crown wildlife management
  - (i) based on existing forest conditions, species, and associated use areas.
  - (ii) integrated with Crown forest management.

(4) Crown forests and associated undeveloped agricultural land:
- (a) Use by public to be assured on crown land. (Map 9)
- (b) Crown wildlife management based on existing forest conditions, species and major associated use areas.

(5) Crown forests associated with developed agricultural land:
- (a) Use by public to be assured.
- (b) Crown wildlife management
  - (i) based on existing forest conditions, species, and major associated use areas.
  - (ii) integrated with extension wildlife management.

(6) Areas of agricultural development:
- (a) Extension wildlife management in conjunction with extension forestry.
- (b) Crown wildlife management in to meet requirements of landowners
  - (i) Nuisance wildlife control.
  - (ii) Controlled introduction of desired species.

### AREAS OF PRIMARY WILDLIFE LAND USE
(Recreational Land-Use also primary)

(7) Water Areas:
- (a) Public and commercial use under Crown control.
- (b) Crown wildlife management based on classification and priority rating.

### AREAS OF PRIMARY RECREATIONAL LAND USE
(Wildlife Use secondary)

(1) Cottage Site Development Areas:
- (a) Reserved specifically for cottage site development.

(2) Parkettes and other Local-Use Areas:
- (a) Permanent reservation and development for public use.

To accompany report "A Wildlife Land-Use Plan for the Glackmeyer Development Area"

Compiled from data obtained by members of the Glackmeyer Reconnaissance, 1966-67. Compilation and drawing by the Site Planning, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario.

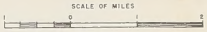
Map No. 11



# GLACKMEYER DEVELOPMENT AREA

## SHOWING

## RECOMMENDED MULTIPLE LAND-USE PLAN







## AREAS DESIGNATED BY MAJOR LAND USE

### RECOMMENDED AGRICULTURAL AREAS

**Block A** — PRIMARY AGRICULTURAL AREA

Agriculture

Period 1960 — 1980
- (a) Improved production on 47 established units.
- (b) Development of additional 53 units (selection of 1st and 2nd choice units).

Period 1980 — 2000
- (a) Development of 29 units (remainder of 1st, 2nd and 3rd choice units).

Period 2000 — 2060
- (a) Development of 30 units (remainder of 4th choice units).

Forestry
- (a) Private and Extension Forestry on Farm Woodlots.
- (b) Crown Forestry
  - (i) Crown Forests — Lots forming part of farm units to be developed 1960 — 1980 (2,600 acres).
  - (ii) Forestry Units ( 3 units ).
  - (iii) Wet Land Areas.

Wildlife
- (a) Extension wildlife management on patented land.
- (b) Crown wildlife management on Crown land.

**Block B** — SECONDARY AGRICULTURAL AREA

Agriculture

Period 1980 — 2000
- (a) Development of 14 units (1st, 2nd and 3rd choice).

Period 2000 — 2060
- (a) Development of 3 units ( 4th choice ).

Forestry
- (a) Private and extension forestry on patented lots.
- (b) Crown forestry on Crown forests (3,300 acres).

Wildlife
- (a) Crown wildlife management until used for agriculture.

**Block C** — TERTIARY AGRICULTURAL AREA

Agriculture

Period 1980 — 2000
- (a) Development of 13 units ( 2nd choice).

Period 2000 — 2060
- (a) Development of 8 units ( 3rd and 4th choice )

Forestry
- (a) Private and extension forestry on patented lots
- (b) Crown Forestry
  - (i) Crown Forests — Lots forming part of farm units to be developed 1980 — 2060 (2,100 acres).
  - (ii) Forestry units ( 1 unit ).

Wildlife
- (a) Crown wildlife management until used for agriculture.

### RECOMMENDED FORESTRY AREAS

**Block D** — PRIMARY FORESTRY AREA (Quaternary Agricultural Area)
- (a) 16 permanent forestry units.
- (b) 3 interim forestry units.

**Blocks E F G** — PROTECTIVE FORESTRY AREAS
- (a) Primarily for protection of stream banks, wildlife management and recreational reserves.

Within Agricultural Blocks

**Permanent F. Unit** — PERMANENT FORESTRY UNIT (in Block A)
- (a) Forest management for at least two forest rotations.

**Interim F. Unit** — INTERIM FORESTRY UNITS (in Blocks A and C)
- (a) Forest management for at least one forest rotation.

### RECOMMENDED WILDLIFE AREAS

WATER AREAS
- (a) Public and commercial wildlife land use under Crown control.
- (b) Recreational land use to conform with major uses.

Within Blocks A D

**Wet Lands** — WET LANDS
- (a) Crown wildlife management.
- (b) Limited forest exploitation.

### RECOMMENDED RECREATIONAL AREAS

**Blocks J K L** — COTTAGE SITES, PARKETTES AND RECREATIONAL RESERVES

**Block H** — WILDLIFE AND RECREATIONAL AREA

### RECOMMENDED URBAN AND SUBURBAN AREAS

(Final Recommendations to be made by Town Planners)

**Block M** — TOWN OF COCHRANE
- (a) Present and prospective areas.

**Block N** — TOWNSITE OF FREDERICKHOUSE (Eastern Portion)
- (a) Part of a plan which may never be implemented.

To accompany report "A Multiple Land-Use Plan for the Blackwater Development Area"

Compiled from data obtained by members of the Blackwater Reconnaissance Completion and draughting by the Air Survey, Research Branch, Ontario Department of Lands and Forests, Maple, Ontario.